ISIETM 2023

EDUCATION, TECHNOLOGY, AND MANAGEMENT

– THE FUTURE OF TEACHING AND LEARNING

2023

MAY 17 -19

New Western University

West Covina, California

International Symposium on International Education, Technology and Management Development 2023

Welcome to the 2023 International Symposium on International Education, Technology, and Management Development in the Post-pandemic Era (ISIETM), taking place from May 17 to May 19, 2023, in the vibrant state of California. We are excited to host this esteemed event, bringing together professionals and academicians from diverse fields to explore the pivotal intersection of education, technology, and management.

Theme: "Education, Technology, and Management —The Future of Teaching and Learning"

As we navigate the post-epidemic era, the 2023 ISIETM is dedicated to exploring the challenges and opportunities within education, technology, and management. In the wake of three transformative years, the conference seeks to re-envision the virtual landscape that has become integral to our existence. Join us as we collectively address the key questions: Where are we headed? What challenges unite us? And, where do our opportunities lie?

Key Highlights

- **Dates:** May 17 - May 19, 2023
- **Venue:** California
- **Focus Areas:** Education, Technology, Management
- **Event Duration:** 3 Days

Conference Tracks

The 3-day event will delve into various aspects, including:
- **Theory and Practice:** Bridging the gap between theoretical knowledge and real-world application.
- **Policies and Administration:** Exploring effective policies and administrative strategies in the evolving landscape.
- **Sustainable Development:** Discussing sustainable practices in education, technology, and management for a resilient future.

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Aesthetic education for pre-school children through ancient poetry songs

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May 10，2023

Aesthetic education for pre-school children through ancient poetry songs

Abstract

Ancient poetry is the treasure and essence of traditional Chinese culture. There are magnificent mountains and rivers, moving plants and trees, true emotions and vivid stories in ancient poetry. In recent years, with the emergence of cultural programmes such as "Chinese Poetry Congress" and "Classics Ariadne", the aesthetic function of traditional culture has been increasingly valued by people. People share the beauty of poetry, feel the fun of poetry, sing poetry songs and fill their lives with poetry through different means. The best way to enlighten pre-school children aged 0 to 6 is undoubtedly to let them grow up from an early age in a subtle way, nourished by ancient poetry. After all, aesthetic education is an important means of improving an individual's aesthetic and imaginative abilities, and it is vital to feel and experience beauty in all its aspects.

Keywords: pre-school, ancient poetry, aesthetic education

Aesthetic education for pre-school children through ancient poetry songs

Abstract

1、 The concept and relevance of aesthetic education in the study of ancient poetry and songs

Aesthetic education is ultimately an aesthetic education, which not only enhances one's aesthetic qualities, but also subtly influences one's overall ability, inspires one's spirit and warms one's heart. Aesthetic education plays an important role in improving students' aesthetic qualities and promoting their overall comprehensive development. As the beginning of the educational process in a person's life, the pre-school years are an important time for children to gradually develop an interest in learning. In the environment of "educating people through beauty and culture", music education, as an important part of children's art education, plays a vital role in the growth of children. As the saying goes, "A book of poetry in the belly is a beautiful thing."Too many parents want their children to become a second Wu Yishu, but children struggle more with learning to recite when faced with slightly obscure and difficult texts. In the Music Literacy class, the budding children under 6 years old are asked to recite and interpret poems and learn ancient poetry songs, together with learning finger rhymes and Orff rhythms, in order to achieve active learning and participation, and to feel and experience the beauty of music on top of learning about traditional culture. On the one hand, through the melodious compositions, the aim of reciting the poems is achieved unconsciously; on the

other hand, the children are subtly instilled with excellent traditional culture, planting the seeds of cultural identity and belonging in their young hearts, promoting their all-round development and achieving the aim of aesthetic education.

2、The different categories of ancient poetry songs

Ancient poetry song works are songs formed by re-scored ancient poems, generally using modern pop music arrangements and orchestration methods to score classic ancient poems, giving the works a unique traditional aesthetic style that is refreshing to the ear. For example, the famous singer and founder of Art Nouveau, Gong Linna, who is known for her divine song "Disturbance", has performed such ancient poems as "General Wine", "Silent Night Thoughts", "Ru Meng Ling", "Flowers Not Flowers", "Three Stacks of Yang Guan" and "Ascent to the High"; and the Chinese classical music singer, Ha Hui, has performed "Guan Ju", "Shi Jing Zi Bei", "Sound Rhythm" and "Spring Dawn". Mr. Ha Hui's crossover classical singing style also represents the combination of Chinese classical music and world music. The vocal students are familiar with works such as Butterfly Lovers, East of the Great River, I Live at the Head of the Yangtze River, Full of River Red, and The Green Jade Case;For example, the theme song of "If you know whether it's green or not" quotes "Ru Meng Ling" by Li Qingzhao from the Song Dynasty, while the lyrics of "The Dance of the Amazing Hong" in "The Legend of Concubine Zhen Huan" are excerpted from Cao Zhi's "Luo Shen Fu"; these works use various imagery and allusions from ancient poetry to create an atmosphere of overlapping time and space and overlapping emotions, which directly affects the popularity of these films and TV dramas. The popularity of these works. The theme songs and interludes of these films and dramas are more well-known in contemporary pop music than the songs of ancient poetry. This series of works is also very representative, as most of

the songs contain profound philosophies of life, and children learn knowledge, musicality, aesthetics and The children learn to be human.

3、Introduction to Gu Jianfen and her New School Song

As a composer, Ms. Gu Jianfen's composed songs, especially school songs, accompanied me throughout my childhood, from "Early Morning, We Stepped on the Path" and "Morning on Campus" to "Today is Your Birthday, My China", "Song and Smile", "Little Girl Picking Mushrooms", "Mother's Kiss" and "Mother in Candlelight"; these excellent works either show the vigour and vitality of young people; or These outstanding works either show the vigour and vitality of young people; or are majestic and evocative; or sing the innocence and loveliness of children. In order to create children's songs that are truly suitable for children and can be widely sung, from 2005 to 2018, Ms. Gu Jianfen took 13 years to publish a collection of 50 songs, including 37 children's songs with ancient poems, 10 songs with ancient verses and 3 made up songs. [i]The songs have proved to be much more popular and influential than the speed of the spread of language. By chanting ancient poetry works, the traditional and excellent knowledge of Chinese studies takes root in children's hearts and brings them correct aesthetics and values.

4、Introduction to "Teaching Children to Sing and Learn the Most Beautiful Ancient Poems" and "Teaching Children to Sing and Learn Vocal Rhythms" by the Green Vine Dad Team

The Ivy Dad team presents the book "Teach Your Child to Sing and Learn the Most Beautiful Ancient Poems", which selects the most classic ancient poems and writes them into songs, allowing children to learn them through singing. The book is divided into three volumes, with 20 songs in each volume, making a total of 60 ancient poems. Selected from the compulsory primary school poems, they balance the difficulty of both the content of the

poems and the melody of the songs, basically satisfying the need to build up children's literacy in Chinese poetry from pre-school to middle primary school. The 'sing-along' format is particularly fun for pre-school children, with catchy poems set to beautiful melodies, making learning poetry easy and unobtrusive. The children will fall in love with the poems in the form of children's songs, and will naturally learn them by heart as they sing them, thus promoting learning through fun and opening up their minds.The book is divided into two volumes, each with 15 rhymes, and was originally intended for children in the Qing dynasty to learn how to compose poems in pairs and master the rhyme scheme. "The clouds against the rain, the snow against the wind, the evening light against the clear sky. The incoming Hong versus the departing swallow, and the persistent bird versus the singing insect." From single-word to double-word pairs, from three, five, seven to eleven-word pairs, the poems are harmonious and catchy. and children read them with a head bobbing as if they were singing. A huge volume of imagery is covered in this set, through which children can learn about astronomy and geography, flowers, trees, birds and animals, while a rich system of ancient cultural knowledge is also included, telling a large number of exotic legends, historical allusions and more. Through this set of books children can experience the beauty of the Chinese language and traditional culture. In the beautiful poetic rhymes of the chapters, they can taste the charm of Chinese culture and develop musical literacy.

5、Take 'On the Pond' (its two parts) as an example

Take Bai Juyi's 'On the Pond' (its second) from the Tang Dynasty as an example. This poem describes a child stealing and picking white lotus, expressing the poet's love for the child's innocent and naive image and his admiration for the idyllic life. On a summer day when the lotus is in full bloom, the poet sees an innocent and lively child, holding a small boat in a pond, looking around and cautiously, sneaking into the pond to pick lotus puffs. When he

returns with glee, he has long forgotten that he went quietly without the knowledge of adults and does not know how to conceal his whereabouts, and returns with a proud and forgetful strut in his boat, leaving a clear and obvious trace of the floating weeds in the pond as his boat gently swings away. This poem uses a combination of descriptions of scenery, action and psychology to portray the simplicity of the boy who stole the lotus. "The phrase 'not knowing how to hide the traces' captures the child's mischievous and naive attitude.

Bai Juyi was a great realist poet of the Tang dynasty and a highly influential poet of the Middle Tang period, whose poetry, with its wide range of subjects, diverse forms and plain language, occupies an important place in the history of Chinese poetry. This poem, 'On the Pond' (its second), is easy to understand, and the psychological portrayal in the poem is so detailed and realistic that it brings the young protagonist to life and onto the page. Through this poem, we see a lively, naughty and innocent protagonist, and we also see that Bai Juyi still has a pure and innocent child's heart at the age of seven. In the classroom, the work is usually studied through a variety of forms such as recitation, appreciation, chanting, percussion or rhythmic activities. In the recitation and appreciation sessions, through explanation, the children can quickly appreciate the mood of the poem, and such vicarious moments as stealing the white lotus and leaving a trail make the children unable to help themselves and even begin to recall similar incidents they have done.The rhythm is based on sitting down, clapping the legs, clapping the hands and swinging the arms up and down. The rhythm of the body is almost identical to the rhythm of the lyrics, imitating the posture of a child sitting down when rowing a boat on the one hand, and the arms alternating up and down like a butterfly fluttering and a regular sliding oar on the other, bringing children infinite imagination. Through recitation, appreciation, chanting and rhythmic movement, the children are soon able to sing the piece in tune with the rhythm, which is certainly a convenient way to educate people through beauty.

6、Conclusion

Aesthetic education is a lifelong educational process, and in order to truly realize the concept of "educating people with beauty and educating people with culture", we need to put aesthetic education in a specific Chinese cultural context and make a more detailed interpretation. [ii]Through "listening and singing, learning and doing", children are educated in aesthetics while at the same time subconsciously cultivating culture and unknowingly infiltrating values.[iii]

References

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[ii] WangLinLin,(2018).Characteristics and significance of Gu Jianfen's "New School Song,*North Music*

[iii] WuPeng, ZhangHao,(2022).The ancient rhythms of Chinese learning are rich in Chinese culture.
Song,*Voices of the Yellow River*

Challenges of Organizational-pedagogical Conditions of Professional Educational Institutions in the Post-epidemic Era

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Abstract

This study examined the challenges of organizational-pedagogy conditions of professional education institutions in the post-epidemic era. This study aimed to offer such institutions a chance to overcome the challenges. Examining the challenges the teachers face will offer a foundation for stakeholders to design models and practices that can help the institutions improve their teaching methods and better their students. The study answered the following research question *"What are the challenges of organizational-pedagogical conditions of professional educational institutions in the post-epidemic period?"* The challenges examined comprised technological issues, student participation, new pedagogy skills, and resource availability. The study adopted a quantitative approach and used secondary data to determine the research question. The study sampled 180 responses from university teachers. The findings established that the challenges, such as technological issues, lack of student participation, resource availability, and new pedagogy skills, significantly affect the organizational-pedagogical condition of professional educational institutions in the post-epidemic era. The correlation analysis established that lack of student participation, resource availability, and new pedagogy skills positively affected the adoption of new pedagogy. In contrast, technological issues negatively affected the adoption of new pedagogy. The researcher concluded that the study was important because it outlined professional educational institutions' challenges when adopting new changes in their organizational-pedagogical conditions. Understanding these challenges would allow such institutions to grow and thrive after an epidemic.

Keywords: Organizational-pedagogical conditions, epidemic, professional educational institutions, quantitative research design.

Acknowledgments

I offer my greatest gratitude for the help I received from this institution, my lectures, family,

and friends for the support and guidance as I conducted this study.

Challenges of Organizational-pedagogical Conditions of Professional Educational Institutions in the Post-epidemic Era

1.0 Introduction

1.1 Background

The coronavirus pandemic has offered a chance to reconsider traditions concerning education in professional educational institutions and in general (Peters et al., 2020). In as much as visualizations for the prospect of professional educational institutions are disputed and varied, there is an increasing agreement that nothing could be inferior to returning to normalcy (Rapanta et al., 2021). The difficulties faced and the absence of preparation experienced by institutions, educational administrators, and teachers display an openness toward novel learning prospects and innovation that were not present prior to the pandemic. Regarding the overall crisis that the coronavirus pandemic caused, particularly in remote teaching (Xie et al., 2021), teachers from every context and grade encountered the need to reconsider their roles; means of helping students learn tasks (Nordmann et al., 2020); and the impression of learners as self-organized students, autonomous social agents, and active citizens. This change needs novel learning for teachers and students. Therefore, this paper uses secondary data from Jain et al. (2022) *"Covid-19 Go Away 2021"* to examine the challenges of organizational-pedagogical conditions of professional educational institutions in the post-epidemic period.

1.2 Research Motivation

Professional educational institutions are a vital contribution to society. They are modeled to generate accountable professionals and guarantee their constant competence within the profession by assisting the professionals in understanding and identifying the significance of progressing professional knowledge and enhancing practice standards. Therefore, it is crucial to have proper teaching approaches and techniques that can help improve such institutions. Examining the challenges the teachers face will offer a foundation for stakeholders

to design models and practices that can help the institutions improve their teaching methods and better their students.

1.3 Research Question

To help in determining this research topic, the researcher formulated the following research question:

- What are the challenges of organizational-pedagogical conditions of professional educational institutions in the post-epidemic period?

1.4 Literature Review

Several researchers have investigated teachers' challenges due to changes made during the coronavirus epidemic. They have outlined numerous challenges in their studies. Pokhrel and Chhetri (2021) state that the most urgent need was to implement and innovate alternative assessment approaches and educational systems after the pandemic. They also state that the coronavirus pandemic offered a chance to open the way for launching digital learning (Pokhrel & Chhetri, 2021). Xie et al. (2021) examined instructional creators' roles within emergency remote teaching during the pandemic. Their study established that the role of teachers changed to building associations in the university community. The special efforts comprised distributing, organizing, and gathering resources; advocating for learners and their profession; offering technology backing; and designing faculty course development workshops (Xie et al., 2021).

Salakhova et al. (2022) conducted a qualitative study to examine the issues of the coronavirus pandemic in higher education. Their study identified that all learners encountered technical issues during distance learning, including personal space for online learning, absence of required equipment, lack of access to online sites because of many users, and poor connection (Salakhova et al., 2022). The findings also displayed reduced practical willingness for remote education, cyber threats, and poor superiority of online resources.

Zalat et al.'s (2021) study established that most teachers agreed that the technological ability to offer virtual courses amplified the educational worth of the involvement of college teachers. According to the teachers' responses, the rate of acceptance of new pedagogy ranked high, followed by apparent practicality and supposed simplicity of use (Zalat et al., 2021). The greatest barriers to new pedagogy approaches were teaching experience, younger age, technical issues, absence of laptops or computers, insufficient computer labs, and unstable internet connectivity (Zalat et al., 2021). Rapanta et al. (2021) state that campus-based educators have encountered forced and unplanned online learning and teaching. However, the forced encounter of teaching with digital methods can slowly offer a chance for the harmonious incorporation of digital and physical methods and tools for more meaningful, flexible, and active learning (Rapanta et al., 2021).

2.0 Materials and Methods

2.1 Research Design

This paper adopts a quantitative research design. Quantitative research refers to explaining phenomena or issues via data collection in numerical form and examining it with the help of statistical and mathematical techniques (Aliaga & Gunderson, 2002). Quantitative research design is based on the positivist paradigm, which advocates for approaches entrenched within statistical breakdowns that include other tactics, such as questionnaires, randomization, hypothesis testing, and inferential statistics (Slevitch, 2011). The reason for conducting a quantitative study was to scrutinize cause and effect and predict future occurrences of organizational pedagogy challenges after an epidemic.

2.2 Data Collection

Data collection refers to measuring and collecting information on variables of interest within a recognized systematic way that allows the researcher to assess outcomes, test hypotheses, and answer the research questions. This paper used secondary data from Jain et al.

(2022), *"Covid-19 Go Away 2021"*. Secondary data refers to data gathered from an already published source. Secondary data is gathered by other people or organizations for other purposes and is reused by a new researcher to answer other research questions (Kabir, 2016). Jain et al. (2022) distributed questionnaires through social media platforms to gather data from teachers between 28th March and 28th April 2021. The educators had been teaching virtually in 2020 during the pandemic. 420 teachers and 709 learners across India responded to the surveys. After cleaning the dataset, the final sample size was 390 teachers and 572 students (Jain et al., 2022).

2.3 Data Collection Instrument

The original data collection used two surveys to collect data. There were two surveys used; teachers filled one out, and students filled out the other. The surveys were administered online. Surveys are often conducted utilizing questionnaires, which are text-based instruments that offer survey respondents a collection of questions or statements to respond to (Brown, 2001).

2.4 Sample Selection

The secondary data from Jain et al. (2022) was large and comprised several variables that were not relevant to this study. Therefore, the researcher selected a sample from the original dataset. The sample was derived from the *"Teacher Survey 390"* dataset. The original data set comprised 390 observations. These observations included teachers who did not teach at professional educational institutions; therefore, they were eliminated from the dataset. There were 64 different variables; however, for the final sample, the researcher utilized 33 variables. The ultimate sample size for this research was 180 observations.

2.5 Data Analysis

To examine the collected data, the researcher utilized descriptive and inferential analysis. The descriptive analysis was used to summarize the data for easy understanding. The descriptive

statistics were presented in the form of tables and graphs. The inferential analysis included a multiple linear regression analysis and a correlational analysis. The following equation presents the multiple linear regression model:

$$ANP = \beta 0 + \beta 1 RA + \beta 2 SP + \beta 3 TI + \beta 4 NPS + e$$

The dependent and independent variables are presented below.

Table 1

Dependent and Independent Variables

Variable Type	Variable Name	Abbreviation	Measurement Level
Dependent	Adoption of New Pedagogy	ANP	Ordinal
Independent	Resource Availability	RA	Ordinal
Independent	Students Participation	SP	Ordinal
Independent	Technological Issues	TI	Ordinal
Independent	New Pedagogy Skills	NPS	Ordinal

The variables are recorded in the form of a Likert scale, where the participants responded by picking either of the five reactions. The variables were coded as 1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, and 5 = strongly agree. Since the responses are ranked in a given order, they adopt an ordinal measurement level.

3.0 Results

This section presents the results from the descriptive and regression analysis. The section is divided into two sub-sections, including descriptive and inferential analysis.
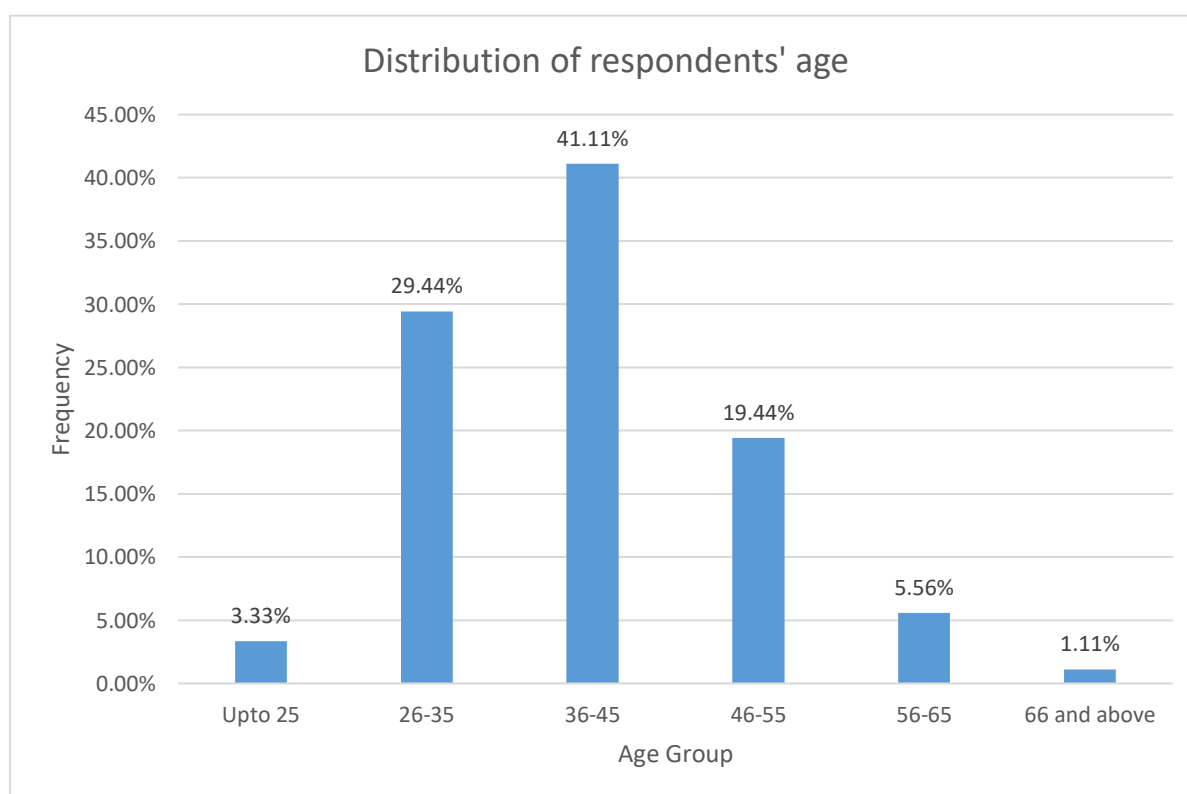
3.1 Descriptive Analysis

Table 2

Summary Statistics of Respondents' Age

| *Age*	
Mean	39.54444444
Median	39
Mode	32
Standard Deviation	9.389356998
Kurtosis	0.467294122
Skewness	0.704062545
Range	47
Minimum	23
Maximum	70
Count	180

Figure 1

Distribution of Respondents' Ages

From Table 2, the mean age of the respondents was ($M = 39.54$, $SD = 9.389$). The minimum recorded age was 23 years, while the maximum was 70 years. Therefore, the sample comprised teachers with sufficient experience teaching university students (see Figure 1).

Figure 2

Type of Schools
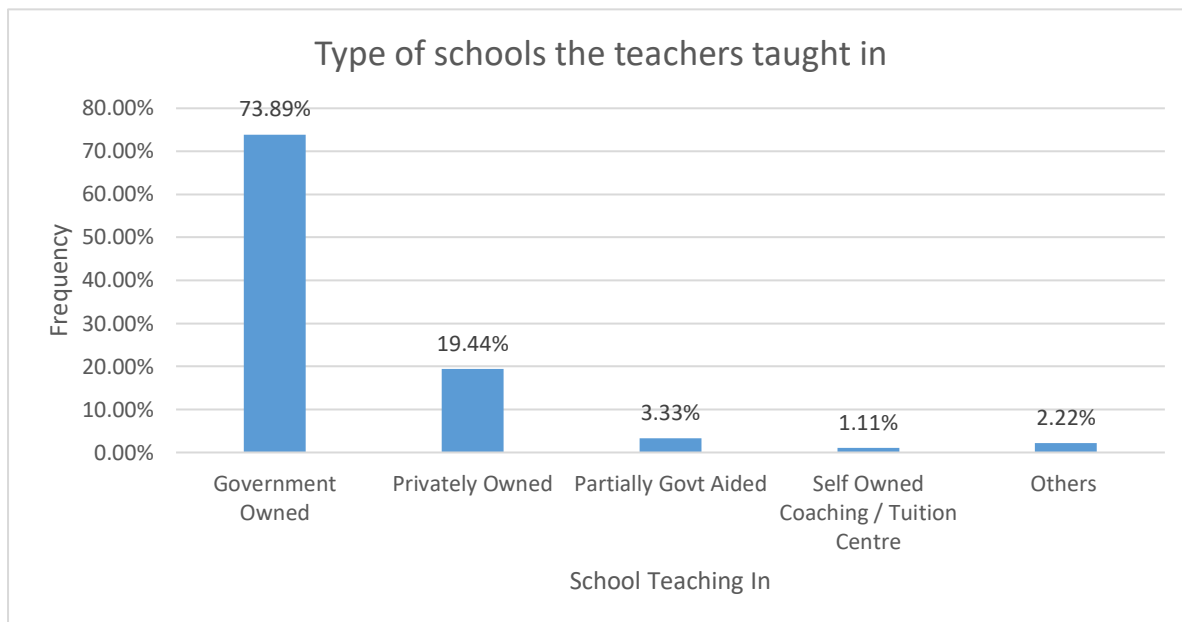
From Figure 2, most of the teachers (73.89%) indicated that they taught in government-owned schools. 19.44% of the teachers taught in privately owned schools. 3.33% taught in partial government-assisted schools, 1.11% indicated self-owned coaching/tuition centers and 2.22% stated others.

Figure 3

Age Distribution of Respondents
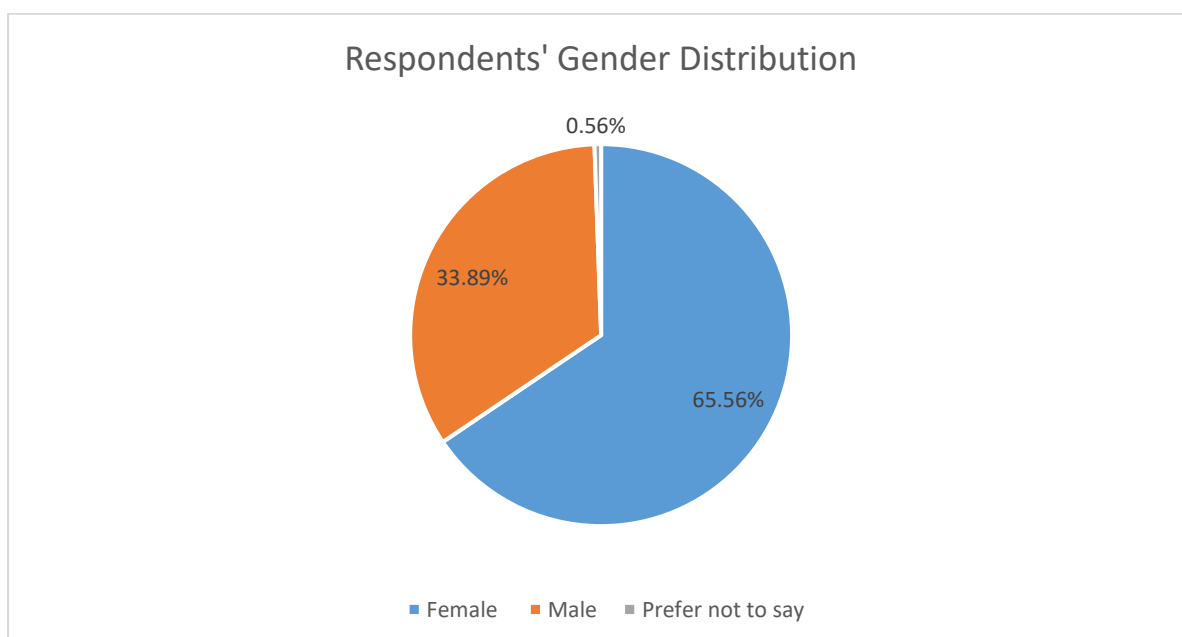
From Figure 3, most of the respondents (65.56%) were females, 33.89% were males, and 0.56% declined to state their gender.

3.2 Inferential Analysis

The inferential analysis was conducted using SPSS. The tests included regression and correlation analysis. The findings are presented in the form of tables.

3.2.1 Correlation Analysis

Table 3

Correlation Matrix

		Adoption of New Pedagogy	Technological Issues	Students Participation Lacking	Resource Availability	Inadequate Pedagogy Skills
Adoption of New Pedagogy	Pearson Correlation	1	-.073	.207**	.282**	.142
	Sig. (2-tailed)		.331	.005	<.001	.058
	N	180	180	180	180	180
Technological Issues	Pearson Correlation	-.073	1	-.089	-.107	-.019
	Sig. (2-tailed)	.331		.235	.151	.802
	N	180	180	180	180	180
Students Participation	Pearson Correlation	.207**	-.089	1	.407**	.349**
	Sig. (2-tailed)	.005	.235		<.001	<.001
	N	180	180	180	180	180
Resource Availability	Pearson Correlation	.282**	-.107	.407**	1	.397**
	Sig. (2-tailed)	<.001	.151	<.001		<.001
	N	180	180	180	180	180
New Pedagogy Skills	Pearson Correlation	.142	-.019	.349**	.397**	1
	Sig. (2-tailed)	.058	.802	<.001	<.001	
	N	180	180	180	180	180

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 presents the output of the correlation analysis. The correlation matrix indicates a weak negative relationship between technological issues and adopting new pedagogy since r = -0.073. However, the relationship between the variables is not significant since the p-value (0.331) is greater than 0.05. The negative relationship indicates that decreasing the

technological issues would increase the adoption of new pedagogy. Students' participation had a weak positive association with adopting new pedagogy since r = 0.207. The relationship between the variables is significant since the p-value (0.005) is less than 0.05. The positive relations mean that increasing students' participation would increase the adoption of new pedagogy in schools. Resource availability displayed a weak positive association with adopting new pedagogy since r = 0.282. The relationship is significant since the p-value (0.001) is less than 0.05. Therefore, increasing resource availability increases the adoption of new pedagogy. Finally, new pedagogy skills had a weak positive relationship with adopting new pedagogy since r = 0.142. However, the relationship is not significant since the p-value (0.058) is greater than 0.05. The positive relationship means that an increase in new pedagogy skills would increase the adoption of new pedagogy.

3.2.2 Regression Analysis

Table 4

ANOVA Output

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	14.189	4	3.547	4.395	.002[b]
	Residual	141.255	175	.807		
	Total	155.444	179			

a. Dependent Variable: Adoption of New Pedagogy

b. Predictors: (Constant), New Pedagogy Skills, Technological Issues, Students Participation, Resource Availability

From Table 4, the ANOVA analysis displays a p-value of 0.002, which is less than 0.05. This indicates that the challenges, such as technological issues, lack of student participation, resource availability, and new pedagogy skills, significantly affect the organizational-pedagogical condition of professional educational institutions in the post-epidemic era.

Table 5

Coefficients Output

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.969	.325		9.137	<.001
	Technological Issues	-.054	.101	-.039	-.532	.595
	Students Participation	.126	.097	.105	1.297	.196
	Resource Availability	.205	.074	.230	2.772	.006
	New Pedagogy Skills	.011	.067	.013	.163	.871

a. Dependent Variable: Adoption of New Pedagogy

From Table 5, there are four coefficients. The first coefficient is technological issues. The output indicates that it affects the dependent variable negatively since B = -0.054. However, the variables do not significantly impact the dependent variable since the p-value (0.595) is greater than 0.05. The second coefficient is student participation. It positively influences the dependent variable since B = 0.126 but does not significantly impact it since the p-value (0.196) is greater than 0.05. The third coefficient is resource availability. It influences the dependent variable positively since B = 0.205. It is the only coefficient that significantly affects the dependent variable since its p-value (0.006) is less than 0.05. The final coefficient is new pedagogy skills. It influences the dependent variable positively since B = 0.011; however, its impact is not significant because the p-value (0.871) is greater than 0.05. The final regression equation that can be used for predictions is presented below:

$$ANP = 2.969 - 0.054TI + 0.126SP + 0.205RA + 0.011NPS$$

4.0 Discussion

4.1 Analysis of Results

This study has examined the challenges of organizational-pedagogical conditions of professional educational instates post-Covid-19 pandemic. The study conducted descriptive,

correlation, and regression analyses. This section links this study's findings to previous studies. The mean age of the respondents was (M = 39.54, SD = 9.389). The minimum recorded age was 23 years, while the maximum was 70 years (see Figure 1). Therefore, the sample comprised teachers with sufficient experience teaching university students. Three variables, including student participation, resource availability, and new pedagogy skills, correlated positively with adopting new pedagogy. This means that increasing student participation by 1 unit will amplify the adoption of new pedagogy by 0.126, increasing resource availability by 1 unit will amplify the adoption of new pedagogy by 0.205, and increasing new pedagogy skills by 1 unit will upsurge the adoption of new pedagogy by 0.011 (see Table 5). Technological issues had a negative influence on adopting new pedagogy. Meaning that increasing technological issues by 1 unit will decrease the adoption of new pedagogy by 0.054.

Previous studies support the finding that these challenges have on organizational-pedagogical conditions. Zalat et al. (2021) determined that the greatest barriers to new pedagogy approaches were teaching experience, younger age, technical issues, absence of laptops or computers, insufficient computer labs, and unstable internet connectivity. Salakhova et al. (2022) identified that all learners encountered technical issues during distance learning, including personal space for online learning, absence of required equipment, lack of access to online sites because of many users, and poor connection. Pokhrel and Chhetri (2021) state that the most urgent need was to implement and innovate alternative assessment approaches and educational systems after the pandemic. They also state that the coronavirus pandemic offered a chance to open the way for launching digital learning. Therefore, this study examined the ability of organizations to adopt new pedagogy based on digital learning.

4.2 Limitations

One limitation encountered in the study was the usage of secondary data. The data was collected for use to answer another research question. Therefore, the researcher had to readjust

the data to suit this study. However, this restricted the researcher from examining other features that could help the study.

4.3 Future Research

Future researchers can conduct a similar study using primary data. This will ensure higher credibility and accuracy. The primary data would be designed to answer the research question specifically. Future studies should ensure they use random sampling techniques to overcome biasness.

<div align="center">

5.0 Conclusion

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This study examined the challenges of organizational-pedagogical conditions of professional educational institutions in the post-epidemic era. The study adopted a quantitative research approach to determine the research question. The study adopted a descriptive, correlation, and regression analysis. The findings established that the challenges, such as technological issues, lack of student participation, resource availability, and new pedagogy skills, significantly affect the organizational-pedagogical condition of professional educational institutions in the post-epidemic era. The correlation analysis established that lack of student participation, resource availability, and new pedagogy skills positively affected the adoption of new pedagogy. In contrast, technological issues negatively affected the adoption of new pedagogy. This study was important because it outlined the various challenges professional educational institutions encounter when adopting new changes in their organizational-pedagogical conditions. Understanding these challenges would allow such institutions to grow and thrive after an epidemic.

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Characteristics of Educational Management of Higher Technical Colleges During the Epidemic Period

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Contents

1.0 Abstract

The epidemic caused by COVID-19 has had a considerable influence on the educational industry all around the world, particularly on higher technical institutes. The purpose of this research is to determine the qualities of educational administration that were present in higher technical institutions throughout the time of the epidemic. We carried out an exhaustive investigation of the pertinent research literature and assessed the information gathered through surveys and interviews with college administrators, faculty members, and students. According to the findings, higher technical schools implemented a variety of solutions, including online learning, blended learning and flexible scheduling, in order to successfully manage education during the epidemic era. The availability of adequate technology infrastructure and support from the teaching staff were both necessary conditions for the successful execution of these methods. The study found that there are a number of obstacles, including a digital gap, insufficient technical support, and a lack of preparation on the part of faculty members to utilize technology. The findings imply that it is necessary for higher technical colleges to continue using flexible and innovative approaches to education in order to respond to the challenges that are posed by the epidemic time.

2.0 Keywords

Higher technical colleges, Educational management, Epidemic period, Online learning, Blended learning.

3.0 Introduction

Higher technical colleges are extremely important institutions in the process of preparing students for employment in the workforce by providing them with the appropriate technical knowledge and abilities. The global education system was thrown into disarray as a result of the COVID-19 pandemic's emergence and higher technical colleges were confronted with a myriad of

difficulties as a result. The swift shift toward online education brought up substantial difficulties such as a dearth of necessary infrastructure including restricted entry to relevant technological resources. In addition to this, the pandemic placed significant financial demands on educational institutions which in turn led to a decline in the overall quality of education. The characteristics of educational management in higher technical institutions during the epidemic period need to be investigated in order to determine the most effective strategies and the obstacles that needed to be overcome. This study will explore the characteristics of educational management that were prevalent at higher technical colleges throughout the pandemic period. This study is to investigate the difficulties that higher technical colleges encountered during the epidemic period, the solutions that colleges implemented to address these difficulties as well as the impact that these tactics had on the quality of education that students received at the colleges. The findings of this study can serve as a guide for educational policymakers, college administrators and educators in the process of designing effective educational management techniques to face the issues presented by the epidemic period.

4.0 Materials and Methods

4.1 Research Design

The research design used in this study is a mixed-methods approach that combines qualitative as well as quantitative data. The study included a comprehensive literature review, surveys as well as interviews to collect data on the characteristics of educational management of higher technical colleges during the epidemic period.

4.2 Literature Review

The outbreak of the COVID-19 pandemic has caused unprecedented disruptions to education systems worldwide. Higher technical colleges, which provide specialized education and training in technical fields, have been significantly impacted by the epidemic period. In response to the

epidemic, educational institutions have implemented various measures to ensure the continuity of learning while maintaining the safety and wellbeing of students as well as staff. This literature review aims to identify the challenges faced by higher technical colleges during the epidemic period including the strategies implemented by colleges to overcome these challenges. The review also aims to identify the characteristics of effective educational management during the epidemic period.

4.2.1. Challenges Faced by Higher Technical Colleges during the Epidemic Period

One of the main challenges faced by higher technical colleges during the epidemic period is the sudden shift to online and distance learning. The rapid transition to online learning has been a significant adjustment for both students and faculty, who are accustomed to traditional face-to-face instruction. Technical courses, in particular, require hands-on training and practical experience, which may be difficult to replicate in an online format (Johnson et al., 2020). Higher technical colleges were not adequately prepared to transition from traditional classroom-based learning to online as well as distance learning. They lacked the technical infrastructure, digital resources, and online platforms required for delivering high-quality education remotely. Many colleges had to scramble to set up virtual classrooms, train their staff in using online teaching tools, and ensure that students had access to reliable internet and computers.

Another challenge faced by higher technical colleges is the limited access to resources, including equipment and facilities. Technical courses often require specialized equipment and facilities, which may not be available to students who are learning remotely. Additionally, the epidemic has caused disruptions to the supply chain, leading to shortages of equipment and materials (Cohen & van der Meulen, 2020). Higher technical colleges faced a challenge in maintaining student engagement and motivation in an online learning environment. Online learning was isolating and students felt disconnected from their classmates and instructors, leading

to a decline in motivation and engagement. Without face-to-face interactions and classroom discussions, students could struggle to grasp complex concepts and were not be able to ask questions in real-time. Moreover, online learning was a significant challenge for students who were not technologically savvy or had poor internet connectivity. Technical issues such as poor audio as well as video quality, slowed internet speed and lack of access to technology devices created additional barriers to learning. These challenges led to frustration and disengagement from the learning process.

The COVID-19 epidemic not only affected the education sector but has also caused significant financial hardships for many students worldwide. Many students lost their part-time jobs, experienced a reduction in income or faced financial strain due to the pandemic's economic impact (Johnson et al., 2020). Moreover, the cost of education increased during the pandemic, with many colleges transitioning to online learning models. Students need access to computers, stable internet connections and other online resources, which required additional expenses. Many students also incurred additional expenses for personal protective equipment and other necessary COVID-19 precautions. Furthermore, students who faced financial hardship had to drop out of their courses or take longer to complete their degrees, affecting their future career prospects. The economic downturn caused by the pandemic also made it more challenging for graduates to secure employment or internships, potentially delaying their entry into the workforce.

4.2.2 Strategies Implemented by Higher Technical Colleges during the Epidemic Period

In order to meet the obstacles that were posed during the epidemic period, higher technical institutions utilized a variety of different tactics. Utilizing online and other forms of distance learning platforms is one example of such a method. According to Yilmaz et al. (2020), educational institutions made use of technology to remotely offer courses to students and provide them with

resources. Students were able to finish their educations thanks to this, even while keeping social distance between themselves and other pupils. Regier further observes that the availability of these platforms allowed educational institutions to communicate with students who may not have been able to participate in conventional classroom-based instruction.

In another study by Basilaia & Kvavadze. (2020), online and remote learning platforms assisted educational institutions in providing a more individualized and adaptable education to its students. This gave students the opportunity to customize their educational experience to meet their unique requirements and interests. The authors also highlight the fact that these platforms served to enhance access to education for students who were geographically remote or who had other constraints that made traditional classroom-based education difficult for them. Platforms for online as well as remote learning helped to build learning environments that were more collaborative and interactive, enabling students to work together and learn from one other in new ways. Even after finishing their official education, students continued to learn new things and improve their skill sets with the help of these online platforms, which contributed to the promotion of lifelong learning and continuous education.

Some educational institutions came up with creative responses to the problem of restricted access to resources, such as the development of virtual laboratories and simulations. The computer-based simulations known as "virtual labs" simulate the conditions and procedures of actual laboratories. Computer programs, on the other hand, are what are known as simulations, and they are used to model or imitate phenomena that occur in real life. These technologies had been utilized in higher education for some time prior to the epidemic, but during the pandemic, their acceptance expanded considerably due to the effectiveness with which they dealt with the limited access to resources. Students were able to obtain real-world experience and get instruction through the use

of these solutions, which took place in a digital setting. Maatuk et al. (2022) conducted research during the COVID 19 era in which they found that students improved their knowledge and skills in microbiology by participating in virtual laboratories just as well as they did in traditional labs. A similar finding was made by Turnbull et al. (2021) in their investigation into the use of virtual simulations to enhance students' knowledge of scientific concepts and to encourage the development of abilities related to scientific inquiry. They gave pupils with access to resources that would not have been available to them otherwise. For students taking biology or chemistry classes, for instance, the use of virtual labs allowed them to conduct experiments without the requirement that they be physically present in a laboratory. Students who did not have access to laboratory equipment either at home or in their local communities benefited tremendously from this opportunity.

Students would have access to the same resources that they would have in a real lab, and they would be able to conduct experiments at their own pace and convenience with the use of virtual labs. In comparison to traditional laboratories, they were more economical. Virtual labs and simulations have allowed educational institutions to reduce the amount of money spent on the construction and upkeep of real labs while continuing to offer students opportunities for experiential learning. This paves the way for a larger number of pupils to have access to resources that were previously reserved for a more limited population. The requirements of each individual student were taken into consideration when designing the virtual labs and simulations. In order for college students to acquire a more profound comprehension of the ideas that were being conveyed, the experiments could be repeated, the variables could be altered, and the data could be manipulated. Because the resources in physical labs were restricted, and because students were required to follow a specific technique, this level of customization was not attainable. Finally,

users could finally access virtual labs and simulations from any location in the world that had access to the internet. This eliminates the necessity for children to travel which in turn reduces the likelihood that they will be exposed to COVID-19. As a result, students will be able to access resources without leaving the convenience of their own homes. Additionally, students had access to all of the materials at any time, which gave them the ability to learn at their own pace and at their own convenience.

The Community of Inquiry paradigm developed by Maatuk et al. (2022) ,demonstrated that cognitive presence, social presence as well as teaching presence are three crucial factors that can assure efficient learning in higher technical colleges. According to the authors, students could benefit from high-quality learning experiences when they participate in collaborative learning which was considered an effective teaching strategy during COVID 19. Students gained knowledge from one another including offering support to one another in order to reach the overall goal of becoming successful as a team. There is a correlation between the variety of interactions that took place between learners and a higher level of satisfaction with the learning process. According to the findings of a study by Gopal et al. (2021), the level of happiness that students experience may be used as a predictor of how they feel about e-learning. Consequently, learning in real-world settings and learning online both offer enjoyable learning opportunities as well as varied rewards. The digital tools that teachers use in the classroom have an impact on the caliber of the educational experiences that students receive.

Students benefited greatly from the flexibility that asynchronous applications provided to the context of distance learning since they were able to access the instructional resources that were made available by their teachers whenever and wherever they choose. Taking into account the findings of a number of different studies, we can conclude that cooperative learning is an effective

technique because of the variety and authenticity of the interactions that occur between individuals. Even though there are now more efficient channels of communication available, there are still worries about whether or not it will be possible to offer students genuine opportunities for genuine social interaction and genuine discussion of a high level. These worries existed during the pandemic and continue to exist now. The students' perspectives on the activity of the instructor and the quality of the contacts between the instructor and the students suggest that the educational activities that take place in the space provided by the institution are more productive. Traditional as well as online training was considered to be of comparable quality and efficacy during the pandemic. This is in reference to the quality and efficacy of online training. However, it was more challenging to evaluate the students' level of competency. The only aspect of competences that was simpler to evaluate in an online setting is the level of knowledge that an individual possessed.

According to Turnbull (2021), the pandemic has created unprecedented challenges for students and faculty alike, including social isolation, increased stress and anxiety, financial difficulties as well as uncertainty about the future. To address these challenges, colleges were proactive in implementing mental health support services and resources. Online counseling was popular option for students and faculty who needed mental health support during the pandemic. Many institutions partnered with online counseling platforms to provide virtual counseling sessions to students and faculty. These sessions were conducted via video conferencing and allowed students and faculty to connect with licensed counselors and therapists from the comfort of their own homes. Some institutions also provided financial support to students who had experienced financial hardship due to the epidemic. In addition to online counseling, educational institutions also implemented mental health resources, such as online mental health screenings,

self-help resources, and mental health hotlines. These resources provided students and faculty with information and support to help them manage their mental health during the pandemic.

4.2.3 Characteristics of Effective Educational Management during the Epidemic Period

The pandemic caused by the COVID-19 virus has had a huge influence on the education sector all across the world. Educational administrators were faced with the challenge of ensuring that pupils' education was not impeded in any way while also preventing the spread of the virus to other people. Adaptability was essential in order for there to be effective educational management throughout this period of epidemic. The capacity to readjust one's behavior in response to novel challenges or shifting conditions in the surrounding environment is known as adaptability. Being adaptable, having an open mind, and being prepared to modify one's strategies in response to shifting conditions are all required qualities. According to Green and Hayward (2019), educational leaders who were flexible were able to swiftly respond to changes in the environment and make the required adjustments to guarantee that their schools continued to run efficiently even after the changes were implemented. During the time of the epidemic, when there were frequent changes in regulations, policies, and procedures, this was of utmost importance.

Resilience, or the capacity to persevere in the face of adversity, is another trait that is intrinsically tied to adaptability. According to Martin and Marsh (2020), educational administrators who were more adaptive had a better chance of fostering a culture of resilience in their respective institutions. This is due to the fact that they were able to swiftly adjust to different circumstances and come up with unique solutions to difficulties that arose throughout the duration of the epidemic. They did this in order to assist their schools in keeping their attention on their objectives and preserving a sense of normalcy in spite of the difficulties brought on by the pandemic. The capability to communicate clearly and effectively is another essential component

of flexibility. Educational managers who were effective communicators were able to communicate information in a way that was both clear and succinct during the pandemic. They were able to successfully listen to the input that was provided by their personnel as well as their pupils, and they utilized this information to make educated decisions regarding how to modify their strategies to accommodate the shifting conditions. As proposed by Dukuze (2021), adaptability also entailed establishing a feeling of community among all stakeholders throughout the outbreak by promoting open communication and collaboration. This was done in order to combat the spread of the disease.

The COVID-19 pandemic presented educational leaders all around the world with issues that have never been seen before, and they need to respond quickly and decisively in order to meet these challenges. According to Shulman (2021), it was widely acknowledged that strong leadership was a vital quality for effectively handling the educational crisis that arose during the epidemic. During the time of the epidemic, those in charge of education were confronted with the difficult decision of determining whether or not to close schools. The leaders had to make choices quickly and with as much information as possible, taking into account a variety of issues such as the welfare of the students, the availability of the personnel and the consistency of the curriculum. In order to exercise effective leadership, one must be able to make judgments that are both well-informed as well as strategic, while also taking into account the specific aspects of the epidemic. Leadership became an increasingly crucial quality of good educational administration as the pandemic progressed since it was necessary to effectively respond to the problems that were brought by the pandemic. Leaders in education made sure to provide crystal-clear advice and direction so that both students and teachers could have a sense of being encouraged and inspired. Effective educational leaders provided support to staff, students, and parents during the pandemic. They recognized the challenges faced by students and staff and provided resources, training, and

emotional support to help them cope with the new realities of the epidemic. Effective leadership also involved promoting teamwork and collaboration among staff to ensure the smooth delivery of remote learning. The leaders had to think outside the box and adopt innovative approaches to teaching and learning during the pandemic.

Adopting new forms of technology, developing innovative approaches to education, and making decisions based on empirical evidence were all necessary components of effective leadership. According to Mishra et al. (2020), leaders created ways to address gaps in access to technology and resources ensure that marginalized students and communities were not left behind and promote diversity and inclusion in educational settings. These goals were accomplished by ensuring that marginalized students including communities were not left behind. Asgari (2021) contends that good leadership during this time period necessitated not only handling the current crisis but also planning for the long-term impact of the pandemic on the educational sector in order to be successful. According to Asgari, leaders established measures in order to handle the social as well as emotional needs of students, manage the financial burden that the epidemic had on colleges and adapt to new forms of teaching and learning.

In general, this review of the relevant literature sheds insight on the difficulties that higher technical schools encountered during the epidemic period as well as the solutions that were put into place to address these difficulties. A flexible approach, creativity, open lines of communication and strong leadership are necessary ingredients for successful educational management during an outbreak. Educational institutions created successful responses to the challenges given by the epidemic period by first comprehending these features and then applying that knowledge.

5.0 Sample Selection

The selection of the sample for this study includes choosing higher technical colleges located in various parts of the world. The participants in the study were chosen through a process known as purposive sampling. Because it enables the selection of a sample based on specific criteria that are relevant to the research issue, the technique of purposive sampling was suitable for this study and should be utilized moving forward (Andrade, 2021). The selection of a sample that is representative of the population of interest—in this case, higher technical institutions during the epidemic period—is another benefit that can be gained through the use of purposeful sampling. The size of the sample was decided upon using the principle of data saturation. This implies that the size of the sample was decided upon when there was no longer any new information or themes emerging from the data. We had a total of 30 responses; ten of them came from college administrators, and the remaining twenty came from students who had prior experience working in educational administration during the time of the outbreak. It was determined that the sample size was sufficient for the study since it enabled a varied range of responses to be collected from a variety of geographical areas and educational institutions. The colleges were chosen because of their stellar reputations and well-established credentials in the field of technical education. The criteria for selection included the participants' availability as well as their willingness to take part in the study. The magnitude of the pandemic's influence on the college as well as the solutions that the college has put into place to lessen the impact of the epidemic are both factors that are taken into consideration by the selection criteria.

5. 1 Data Collection

Surveys and in-person interviews were used to collect data for the study. Participants, including college administrators, faculty members as well as students, were asked to fill out an online survey questionnaire that included both closed- and open-ended questions. The

questionnaire was sent to participants via the internet. Questions based on a Likert scale were included in the set of closed-ended questions, but the participants were given the opportunity to submit thorough responses to the open-ended questions. The purpose of the survey questions was to collect data on the ways that higher technical institutions had employed to manage education throughout the period of the epidemic as well as the problems that were encountered and how effective the strategies were. Before being allowed to take part in the research, participants were needed to give their informed consent and the survey was made available in English. The poll allowed participants to remain anonymous so that they would feel more at ease delivering responses that were honest as well as accurate.

The interviews were carried out with a select group of the participants, and the information gleaned from them was considerably more in-depth than that which was obtained via the survey. It included the participation of important informants from each college, such as the college principal or director, the head of the department of technical education, faculty members including students. The duration of each interview was around half an hour and the entire process took approximately one and a half months to complete. Some of the interviews were conducted through a method known as mutual synchronous interviewing by making use of tools like zoom. Detailed written notes were taken throughout this procedure. Additionally, in certain parts of the investigation, the interview was delivered to the school administration based on the criteria for selection (by converting the form into a survey form software offered by Google), and their responses were afterwards obtained, read and analyzed. The interviews were also carried out over the phone or through video conferencing and all of the participants gave their permission for the recordings to be made. They wanted to gather information on the participants' experiences including the participants' perspectives on the qualities of effective educational administration

throughout the epidemic time. For the sake of analysis, the interviews were both audio recorded as well as transcribed.5

5.2. Data Analysis

The procedure of assessing the data that was obtained from the survey made use of both descriptive statistics including qualitative content analysis as its two primary methods of analysis. For the purpose of analyzing the responses to the closed-ended questions, descriptive statistics were applied on the other hand, content analysis was utilized for the purpose of analyzing the responses to the open-ended questions. We conducted an analysis of the transcripts from the interviews in order to discover the most significant recurring themes including patterns that emerged from the data. The analysis of the data was guided by the research questions as well as the aims of the study. Tables as well as graphs were used to illustrate the findings of the study. The interview audio recordings needed to be transcribed first in order to get started with the data analysis. This was the first thing that had to be done in order to get started. After that, the transcripts were reviewed and read multiple times to ensure that a comprehensive understanding of the subject matter was attained.

The next step was to code the data, which involved identifying and naming the key concepts, themes as well as categories that emerged from the data. This was done in order to prepare the data for further analysis. This was completed before moving on to the next phase in the process. Throughout the entirety of the process of coding, the research questions as well as the overarching objectives of the study served as additional sources of direction. The process of coding was iterative, with codes as well as categories being updated and amended as necessary when more data was evaluated and processed through the system. This was done in order to account for any new information that came to light. In order to make the process of analysis more manageable, the

codes and categories were written down in a codebook which also served as a reference manual for when it was needed in the future.

After the coding procedure was finished, the data were grouped into a matrix which made it possible to recognize patterns including links between the different categories as well as codes. Additionally, the matrix makes it easier to compare data from a variety of institutions as well as geographical areas (Kim et al., 2019). The interpretation of the data was the last step in the process of gathering as well as analyzing the data. Following the completion of the analysis, the themes including patterns that manifested themselves were analyzed in light of the research questions as well as the goals of the study. Additionally, the interpretation was based on applicable theories and concepts gleaned from the previous research.

5.3 Equipment and Instruments

Researchers used an interview script as well as a survey questionnaire to collect data from study participants. The interview guide and survey questionnaire were created with the study's goals and research questions in mind. The survey questionnaire had both open-ended as well as closed-ended questions, but the interview guide only had open-ended questions. Preliminary testing was done to ensure the instruments' accuracy as advertised. We used a number of electronic devices including computers, telephones as well as video conferencing software in the course of this probe. Survey instruments were developed using web-based survey tools, and interviews were conducted using phone or web-based video conferencing applications.

In general, the research design that was used for this study was suitable for the accomplishment of the research purpose as well as the research objectives. The analysis of the relevant literature offered a full grasp of the difficulties that higher technical institutions encountered during the epidemic period including the qualities that constitute efficient educational management. The online survey made it possible to collect a wide variety of responses from

college administrators as well as students located in a variety of geographic areas. The methods of data analysis that were utilized were suitable for the task of analysis and evaluating the data obtained from the survey.

6.0. Results

Fig 1: Below are presented as dimensions the themes and codes developed in accordance with the views of school administrators.
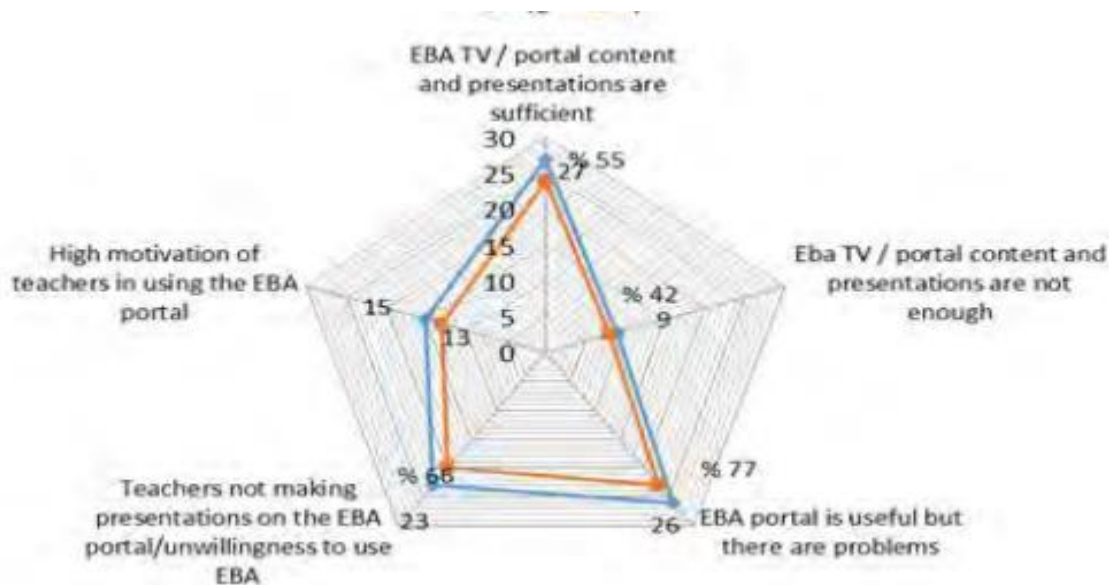
The study found that higher technical colleges adopted various strategies such as online learning, blended learning, and flexible scheduling to manage education during the epidemic period. The implementation of these strategies depended on the availability of technological infrastructure including support from the faculty members. The study also identified challenges such as the digital divide, inadequate technical support as well as faculty members' lack of readiness to use technology.

Educational administrators faced significant challenges during the COVID-19 pandemic, as they had to ensure that students' education continued uninterrupted while also keeping them safe from the virus. Adaptability was identified as a critical quality for effective educational

management during the epidemic period with 90% of administrators reporting that adaptability was key characteristic during the pandemic. This involved being flexible and open-minded, willing to modify strategies to respond to changing conditions brought about by the pandemic. The remaining 10% of the respondents experienced a little or no adaptability during the pandemic period. Effective communication was also essential, as educational managers needed to communicate clearly and listen to input from all stakeholders to make informed decisions. Resilience was another key characteristic of effective educational management during the epidemic, as it allowed leaders to persevere in the face of adversity and come up with unique solutions to the challenges posed by the pandemic. Good leadership was also identified as a crucial quality for effective educational management during the epidemic, as 85% of the administrators reported needed to make well-informed and strategic decisions while considering the specific aspects of the pandemic.

Table 1: What actions school administrators take to ensure classes be held as usual throughout the COVID-19 pandemic.

Interview Question	Themes	Frequency(f)
As a school administrator, how did you ensure that students' education continued despite the COVID- 19 pandemic?	Maintaining Communication with teachers	20
	Individualized timetables are made for students who require special instruction.	3
	The school administration's weekly deployment of a distance learning program.	21

	Transition to online education	30

Administrators reported having developed and used emergency procedures in the wake of the COVID-19 epidemic. The vast majority of students acknowledged the fact that the quality of the instructional process is altered to a significant degree when classes are delivered in an online setting. The students expressed their belief that the authenticity of face-to-face encounters cannot be matched by those that take place in a virtual environment since the two types of interactions simply cannot be compared. When delivered in person, the ideas discussed are far simpler to grasp than when they are spoken in isolation. In the setting of online instruction, some of the students experience a decrease in their level of motivation for learning, which is another disadvantage of this mode of instruction. Because of this, the evaluation procedure is being disrupted, and the students are beginning to worry that their skills will only be evaluated on the most surface-level possible.

The majority of respondents thought it was beneficial that the majority of the online classes they took were at an average level of difficulty. The vast majority of students express a desire to acquire feedback from their instructors on a regular basis or at all times. Students voiced their opinion that the teacher should be the one to determine the frequency at which they should receive feedback on their work. Additionally, the majority of students have reported receiving feedback from their lecturers on a regular basis. According to the findings of the study, only a tiny percentage of students (7%, which equates to 8 students and 20%, which accounts for 12 students) did not experience any difficulties during the process of online learning. The most common challenges cited by users include a lack of internet access or issues connecting to the internet, physical exhaustion, mental fatigue as well as technical difficulties connecting to certain platforms.

Students who selected a different answer mentioned challenges, such as paying attention, adjusting to new training circumstances, physical consequences caused by prolonged use of the computer (like headaches, back pain including irritation of the eyes) as well as contradiction of instructional techniques with students' preferred methods of learning.

7.0 Discussion

The research shows that in order for colleges with a technological focus to address the challenges of our current era, they must maintain an open as well as innovative approach to teaching. The study also emphasizes how vital it is to provide a sufficient technology infrastructure including support for the successful deployment of other tactics like online learning. The results of the study demonstrate the importance of giving academics support including training so they may grow more accustomed to using technology. The study also demonstrates that face-to-face contacts are more beneficial than online ones for learning. The majority of students on the other hand seem to agree that one of the biggest issues with online learning is that it makes it more difficult to form close bonds with instructors as well as peers. The fact that more students may now access educational resources owing to online learning is a significant benefit. Students believe that colleges are superior at creating dynamic learning environments. At this level, the majority of the time dedicated to learning tasks was spent on the students' own initiative as well as labor. The students expected their teachers to try something different in the classroom. Enrollment in online courses increased even though more students said they avoided them whenever possible. The administration had found itself in a difficult situation.

According to the findings of the study, the quality of the didactic act was diminished when there were no opportunities for face-to-face encounters. While there are some students who have favorable ideas of online learning including recognizing its importance as well as the benefits it

offers, there are other students who would rather take classes in person. In this setting, there was not a significant decline in the overall quality of the classes rather, there was a decline in the overall quality of the interactions that took place between the students and the instructors. It is important that learning environments be appealing as well as easy to reach so that students do not experience mental or physical exhaustion. Through conversations and other forms of interactive education, teachers should also make more attempts to build strong as well as fruitful relationships with their students.

This examination of the students' perspectives regarding online college courses was carried out among those students who were pursuing either a bachelor's degree or a master's degree in the subject of Educational Sciences. It is possible that the particular of the contents in this subject as well as the methods of their dissemination and absorption, can be analogous to those of the socio-human sciences from an instructional point of view. It will be possible to emphasize possible parallels and distinctions and, indirectly, ways to enhance the quality of the teaching and learning procedures that are carried out in higher education via the use of scientific research

8.0. Conclusion

In conclusion, the purpose of the research was to analyze the various approaches taken by higher technical institutions to the management of education during the period of the epidemic, as well as the challenges these institutions faced and the efficacy of the methods they put into place. The method of deliberate sampling was used to identify a total of thirty participants for the study. These individuals included college administrators, members of the faculty as well as students who had previous experience working in educational administration during the outbreak. The analysis was carried out via descriptive statistics as well as qualitative content analysis. The data was acquired through the use of online questionnaires as well as in-person interviews. According to

the findings of the study, higher technical institutions were confronted with considerable problems during the epidemic. These challenges included a lack of technology infrastructure, insufficient training for faculty members as well as difficulties in retaining student involvement. However, the research also discovered that educational institutions have devised a variety of techniques in order to address the problem. These tactics include online teaching platforms, remote work, and enhanced contact and collaboration amongst faculty members.

The research shows the significance of efficient educational administration during times of crisis and emphasizes the requirement for institutions to be adaptable and flexible in response to shifting conditions. The study sheds light on the opportunities as well as problems that are brought about by online and remote teaching and learning as well as the potential for enhanced collaboration and communication inside educational institutions. In general, the research makes a significant contribution to the existing body of knowledge on educational administration during times of crisis and offers insightful new perspectives on the tactics and procedures utilized by higher technical institutions during the outbreak. The findings of the study have the potential to not only influence future policy and decision-making in the field of technical education, but also have the potential to be applied to other sectors of education and beyond.

9.0 Acknowledgments

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THE CHARACTERISTICS OF THE "1+X CERTIFICATE" SYSTEM TRAINING IN THE POST-EPIDEMIC ERA IN CHINA – A SYSTEMATIC REVIEW OF LITERATURE

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Abstract

When Premier Li Keqiang launched a paradigmatic "1+X Certificate" educational reform in 2019, the future of Chinese higher education was changed. This analysis performs a systematic literature review on this monumental reform to understand the progress in reform implementation and probable improvement. The research is significant to have unified and consolidated literature around the relatively novel topic of investigation. The literature review is conducted on peer-reviewed literature ranging between 2020 and 2023. The main findings from the literature are a significant success and positive outcomes of implementing the "1+X Certificate" training reform. However, the research notes a significant challenge in integrating all the stakeholders in the triple helix structure. The discussion notes the importance of actively integrating all the leading voices in the reform process. The paper notes the need for more targeted training programs while redefining the role of public-private partnerships in vocational education. The paper concludes that the system has the potential to facilitate the country's transition to a knowledge-based economy. Still, the government and leaders implementing the reform must encourage collaboration of all the stakeholders in the continued improvement and monitoring of the "1+X Certificate" reform.

Keywords:

"1+X certificate" system, vocational education, "1+X Certificate" and the post-epidemic era, education reform in China, and "1+X."

Introduction

Background Information

With the increasing complexity and dynamism in the global workforce and socioeconomic structures in the post-epidemic era, it is continually essential that the education system evolves in line with such rapid changes in skills requirements (Liu, 2020). The struggle to integrate vocational training in official educational and academic space has remained central to international education change discourse. From such inspiration, the Chinese government – as commissioned by Premier Li Keqiang – decided to launch a paradigmatic educational reform in 2019 (Liu, 2020). Consequently, the government published the "Implementation Plan on National Vocational Education Reform." This reform was popularly named the "1+X Certificate" System Training by the educational technocrats in the country. It seeks to streamline the comprehensive educational system in the country shown in Figure 1 below.
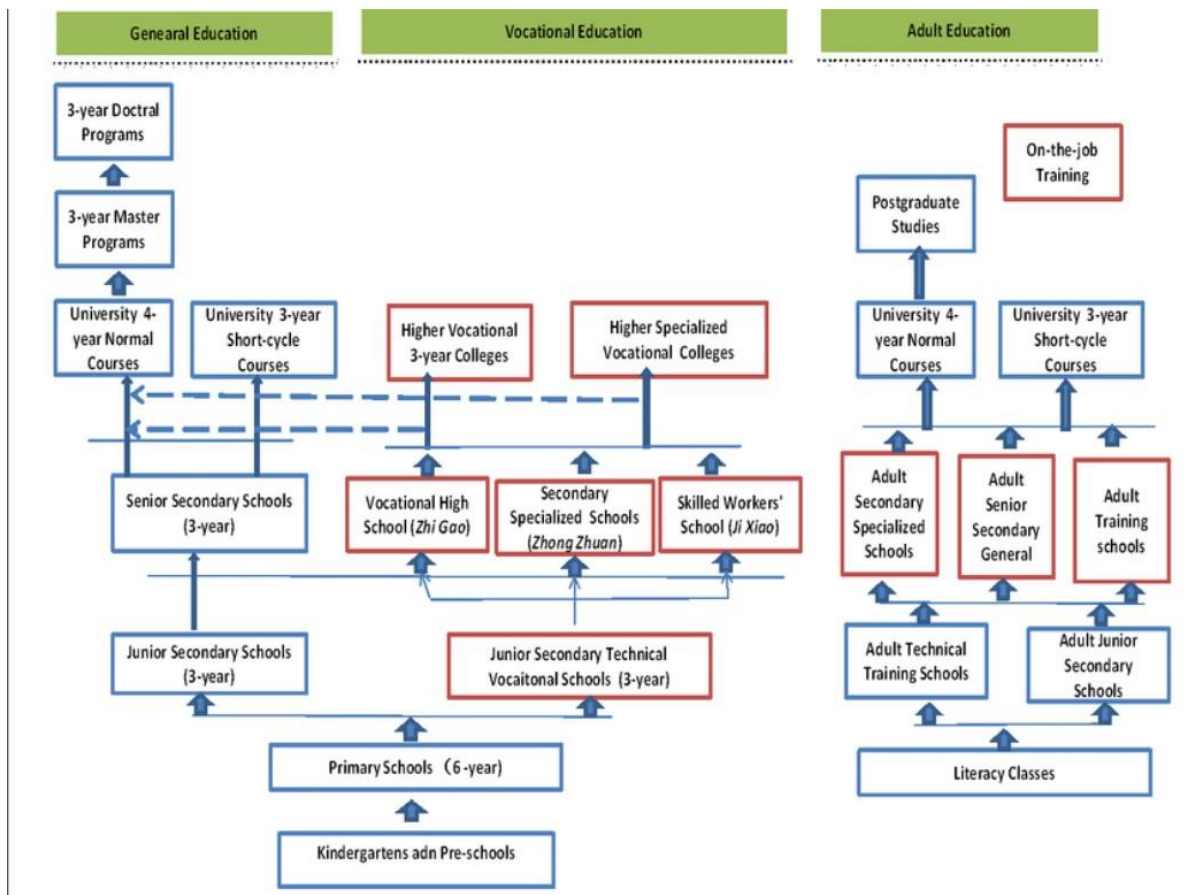
Figure 1: China's Education Structure

The central role of the "1+X Certificate" was to elevate the vocational training certificates in the country from the 'second choice' status to academic qualifications. The innovation prioritized the development of vocational education and implemented the 1+X certificate system. This system would provide more comprehensive and practical training programs for individuals seeking to enhance their employability (Chen, 2020). It would also compel the students seeking academic excellence to gain a range of occupational and practical skills. Therefore, the country's educational structure would develop a "credit bank" that would necessitate the transferability of such skills certifications for the students (Australian Government Department of Education, 2023).

As an innovative approach to educational change in the country, this approach requires policy, research, and goodwill practice (Chen, 2020). This comprehensive analysis of

the innovation is especially relevant in the post-epidemic era. The COVID-19 pandemic of 2019 necessitated an unprecedented revolution in the skills domains nationwide. New job areas were introduced that required highly dynamic and multi-skilled employees. This, therefore, required schools and other social institutions in the country to shift significantly and align with the dynamic socioeconomic and digital revolutions (Chen, 2020). Therefore, the 1+X certificate innovation could not arrive at a better time.

Considering the significant novelty of the "1+X Certificate" innovation, research around the implementation, characteristics, and success is significantly scarce. While various researchers have published papers and journals regarding the topic, such research is significantly novel and scattered (Ji, 2021). Further, such research is not methodologically robust, considering the significant time limitation of the innovation. It is, therefore, necessary to conduct a systematic review of such existing literature and note the emerging themes and future research directions. This research seeks to address this gap in the literature by seeking to review various peer-reviewed literature around the characteristics of the "1+X certificate" training system.

Literature Review

In the wake of the Coronavirus pandemic of 2019, China – like other countries globally – grappled with the question of skills transferability. The epidemic changed various individuals' skills and job descriptions, especially in the service industry. Researcher Yang (2020) notes that the pandemic created an urgent need to restructure the educational and workforce settings to accommodate the emerging needs of a hybrid socioeconomic structure. This pandemic accelerated an ongoing discourse around the need for a highly robust citizenry to survive the digital revolution (Ji, 2021). Innovations in the post-industrial age complicated society and the dynamism of emerging jobs. Consequently, researchers and policymakers

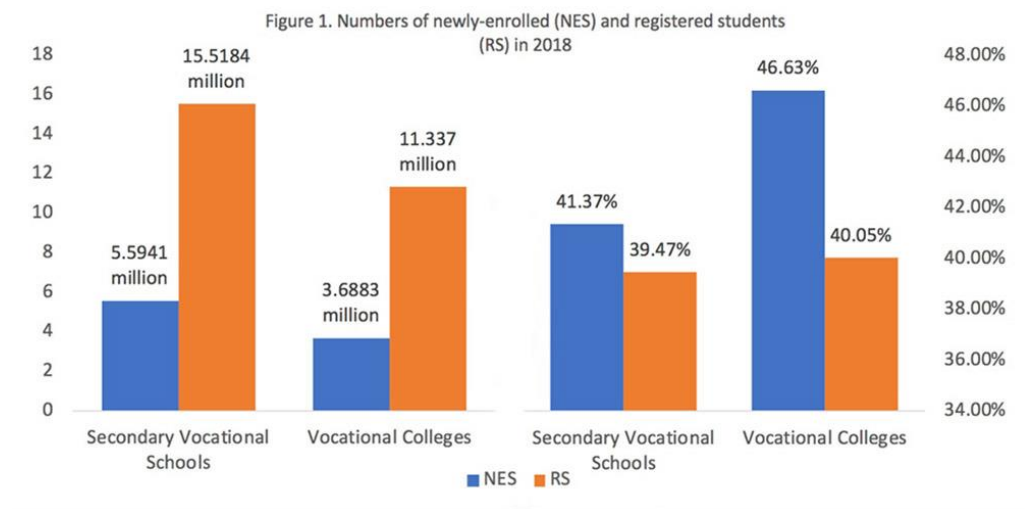began creating responsive training and educational systems for this unpredictable emerging reality.

Figure 2: The number of newly enrolled students in Vocational Training in China

The 1+X certificate system is one of the most disruptive educational change reforms in the Chinese educational system in recent times. Introduced in 2019, this reform was lauded by various analysts as futuristic and highly responsive to the changing socioeconomic and digital reality (Australian Government Department of Education, 2023). According to Deng Zemin and other experts from the Institute of Vocational and Technical Education Center of the Ministry of Education in China, the "1+X certificate" system serves as both an education and labor certification process. It connects education and work by identifying students' professional abilities, social structures, and labor management (Australian Government Department of Education, 2023). They suggest that China should accelerate the development of a professional qualification framework and accurately define the nature of the "1+X certificate." The researchers advocate for a design of the labor certification system to improve the education and labor certification system.

Current research is overwhelmingly positive around the need to adopt the innovative 1+X model in the certification of higher education students in China. Zhang Chi and Zhang

Lei of Xingtai Vocational and Technical College – as reported by Liu and Wang (2020) – propose that the manufacturing industry's transformation and upgrading require high-skilled personnel to have a compound professional quality (Ji, 2021). Such skills should be diverse, including technical knowledge, vocational skills, innovative ability, and craftsmanship.

Based on the vocational quality configuration of high-skilled talents, vocational education should establish a "1+X" education and collaborative training system. Such education and training pathways will seek to expand the concept of "high-skilled talents" to include social students (Ji, 2021). After expanding the definition of the futuristic learner, the new and innovative education system builds a "1+X" collaborative training system for such learners. These studies interrogating the "1+X" model appear to be lacking in their definition of the suggested collaborative approach (Ji, 2021). While these studies point out the need to follow the triple Helix collaborative structure, they do not proceed to outline the frameworks for such collaboration. The research does not allocate specific levels of responsibility to the three collaborative industries (government, academia, and industry).

As noted variously in research, education through formal academic pathways lays a solid foundation for students' sustainable development. However, such highly theoretical and managerial-level education should be accompanied by more practical vocational training that allows individuals to apply contextualized problem-solving skills (Ji, 2021). The "X" vocational skill level certificate training horizontally expands their professional qualities. These allow them to achieve proper coordination and integration at the macro, meso, and micro levels. However, there is still a lack of research on constructing the "1+X certificate" system (Ji, 2021). As a result, scholars mainly discuss and study it from the perspectives of the certificate system, qualification framework, and training coordination system. Research should focus on purposefully analyzing the two components of the innovative training model.

Analysts must focus on continuously researching and exploring the design and construction of the "1+X certificate" system (Ji, 2021).

Purpose and Significance of the Study

As noted in this analysis, research on the characteristics and implementation of the "1+X certificate" system is presently highly novel. As such, the research is scattered and highly disjointed. This current study aims to consolidate such research outcomes into a coherent research literature. This shall be done through a systematic review of available primary findings in the literature around this innovative educational reform. This paper shall interrogate the available qualitative and quantitative research on the "1+X certificate" system, especially in the post-epidemic era. Such a study is motivated by the glaring need for research that contextualizes such innovation to the realities faced by the various stakeholders developing and experiencing the reforms. The need for unidirectional research on educational innovation in the country shall assist in informing both practice and academia on the success of the innovation and the potential for future reforms.

Research Methodology

The research philosophy applied in this investigation is the positivism approach. From a positivistic viewpoint, the author looks at the concept under investigation from an 'out there' perspective. As such, this investigation solely focuses on the available scientific and policy facts on ecotherapy. The author shall attempt to avoid the personal biases that may influence the scientific facts and opinions on the phenomenon under study. The positivistic approach sees the world as controlled by a set of rules and facts and that these facts must be specifically used in inferring such phenomena.

This systematic review of available scientific research shall focus on reviewing available scientific research on the characteristics and implementation of the "1+X model."

This study, therefore, began by selecting renowned global scientific databases with peer-reviewed journals. Some major scientific databases selected for this study included Sage Journals, Scopus, Web of Science, Nature, and ScienceDirect. Other sources complementing these major scientific resources include ResearchGate, Google Scholar, and Academia-Research.

The author then searched for various relevant peer-reviewed abstracts and literature related to the topic under review using keywords like: "1+X certificate system," "vocational education," "1+X Certificate and the post-epidemic era," "education reform in China," and "1+X." When the specific journal entries were unavailable or insufficient, the researcher applied synonyms of the keywords. Initially, the analyst shall select 100 articles and journal entries for this investigation.

Number of Articles	Exclusion Criteria
100	All included
56	English Language
23	Year of Publication (2020-2023)
17	Peer-Reviewed Articles
12	Full-length Journal Entries

Through close investigations of the selected and sampled abstracts and keywords, the analyst shall exclude or include the entries depending on their specific fit for the present research. Finally, the analyst narrowed the articles to 12 peer-reviewed entries. Two main inclusion criteria were the language and year of publishing of the journal entries. These articles must be published in English in the post-pandemic period (from 2020 to 2023) and contain a significant thematic component for the present analysis. Being a systematic review, the main ethical consideration in the study was to respect the intellectual integrity of the

studies involved in this systematic review. The analyst committed to properly recognizing the authors credited for the original research pieces.

Results and Findings

The reviewed research is unanimous on the importance of innovation in integrating vocational skills training in the main higher education qualifications (Chen, 2020; Ling et al., 2021). Such studies revealed the benefits of such innovations, especially in the post-COVID epidemic period (Liu, 2021). The commitment to improving vocational skills from second-choice skills is something the Chinese government has continued to implement over the past few years. Research notes that the Chinese government has increased investment in vocational education and training in the years leading to implementing the 1+X (Ji, 2021; Liu, 2021). Nonetheless, it is noted that the policy commitment to the "1+X certificate" system by Premier Li's government signifies significant progress in the actualization of vocational skills integration in education (Liu, 2021; Yang, 2020; Yue et al., 2023).

Number of Articles	Common Thematic Areas
8 Articles (67%)	- Improvement of vocational skills is a key area of focus. - Increased investment in vocational education and training in the years leading to implementing the 1+X
12 Articles (100%)	- 1+X presents significantly more advantages than challenges. - Stakeholder collaboration is key for improvement.
7 Articles (58%)	- Stakeholder collaboration is presently significantly properly approached. - Reform implementation process is still mired in various systemic and technical challenges

Further, research around integrating the +X certificate system is properly supported by the three key categories of stakeholders, including the government, industry, and academia (Liu & Wang, 2020; Wang, 2022). Research unanimously indicates that the government sought to encourage companies to participate in vocational education and training (Yuan & Wang, 2021; Yue et al., 2023). Consequently, research notes that the "1+X certificate system" has been widely adopted in various industries in China. These industries have bought into the innovation of the educational system, especially in the post-epidemic period owing to the dynamism that was observed in skills requirements in all the industries (Liu & Wang, 2020).

The increasing interest in the innovative education model is further shown by the increased number of students admitted to higher education in vocational education programs. According to research, the number of students enrolled in vocational education and training programs increased by 7.9% in 2020 (Guo & Pilz, 2020; Liu & Wang, 2020). Further, there was a 14% increase in students who gained vocational qualification certificates across the country's higher education settings. As such, research unanimously outlines the successful implementation of the "1+X" certificate system in the early implementation periods (Guo & Pilz, 2020). There is an overall positive response to the innovation by the government – with the higher education sector and the industry appearing to agree on the need for such a futuristic and socially constructed learning pathway (Guo & Pilz, 2020; Ling et al., 2021).

Following the implementation of the "1+X Certificate" system, all the research interrogated attributes the innovation to various advantages and characteristics. The training and vocational education system is noted to be flexible and customizable to the workplace's specific needs (Wei, 2020). This was noted as a significant competitive advantage for China in the wake of the intense globalization through the network age – a paradigm that seems to have reached a new peak in the post-COVID-19 pandemic age (Ling et al., 2021). The other advantage of this innovative educational reform was its ability to provide a clear career

pathway for learners. Researchers noted that this system allowed learners to gain industry-specific certificates that can enhance their employability (Wei, 2020; Yang, 2020). Finally, the practicality of the new system allows for boundless innovation that may give rise to new industries and support the transformation of traditional industries.
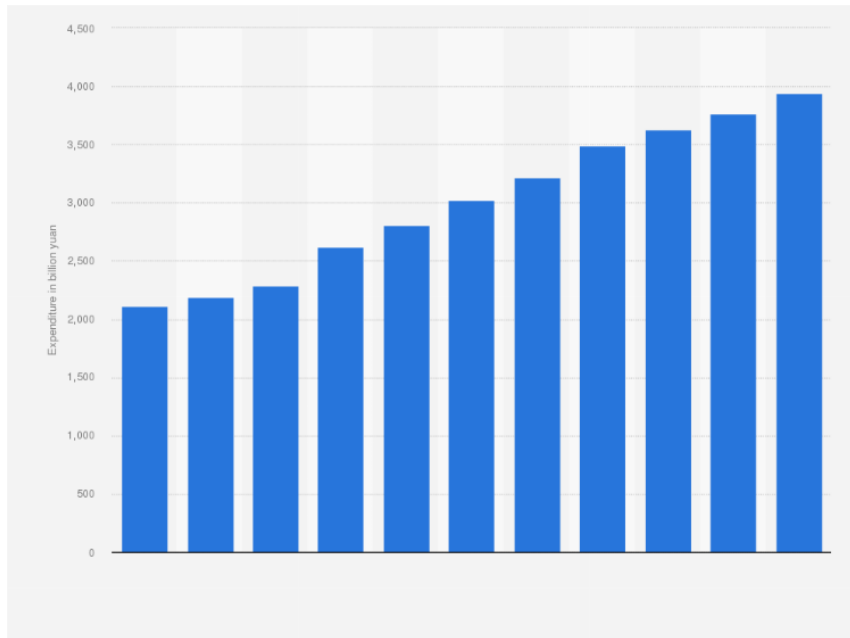

Figure 3: Expenditure in Education In China in 2022

Despite this range of positives in implementing the "1+X certificate" system, the implementation process is still mired in various systemic and technical challenges (Yang, 2020). The main challenge to this continued implementation of the reform is the lack of uniformity in the quality of training and the certification standards (Yuan & Wang, 2021). Research further notes that the country is presently struggling with implementing the reform owing to the inadequacy of highly trained personnel to implement the vocational and educational pathways in unison (Yang, 2020; Yuan & Wang, 2021). From the research, however, the government proposes a series of measures to streamline the educational system arising from the innovation. However, the research does not discuss the potency of such a suggested series of changes to the reform.

Discussion

The findings of this study align with the propositions made in the introduction of the study regarding the benefits of the reforms. There is significant unanimity in research around the significant benefits of upgrading and recognizing vocational certification in the country. The workplace and accompanying necessary skills appear to evolve rapidly due to the fast-changing workplace. This is seen as especially relevant in the post-pandemic period. The emerging workplace requires personnel and human capital that is diverse, practical, and highly futuristic. The previous sole focus on one line of academic qualifications is not enough anymore. Therefore, the researcher for this study agrees with the study's findings that support the implementation of the "1+X Certificate" system (Yuan & Wang, 2021). The system promotes socially and economically relevant skills directly applicable to various lived and industrial situations (Liu, 2020).

While research supports the involvement of the triple helix components in innovation and reform implementation, it advocates for an increased and highly deliberate approach to such collaboration. The available research appears insufficient in its documentation of the current collaboration processes seeking to completely align the interests of the three components of the triple helix (Liu, 2020). The research also notes that the government has proposed a series of measures to streamline the educational system arising from the innovation (Australian Government Department of Education, 2023). This would be assumed to suggest a lack of full acceptance and adoption of the collaborative approach to the reform. As such, the analyst suggests that the key stakeholders must work collaboratively and ensure the problem areas are sufficiently addressed and agreed on by all the stakeholders (Liu, 2020). The leaders of this reform must bring all the critical stakeholders to the table to seek their unique and evolving input about the implementation and changes to the reform.

The main limitation of this study involves the significantly narrowed literature on the topic. Being a significantly novel area of analysis, the research around the reform is significantly limited in both time and scope. Further, the research is limited by the language of inclusion and exclusion. While the researcher only selected articles written in English, there is a general feeling that most articles and policy documentation around the topic are written in a different language (in Chinese). The final limitation of the study was the overarching focus on the Chinese setting (Australian Government Department of Education, 2023). As this reform is presently only implemented in China, the research needed a different context that could offer alternative outcomes for such implementation. Nonetheless, further research should focus on contrasting China's vocational education reforms to similar reforms globally. China needs to align and standardize its innovations in the context of global settings.

Conclusion

The current study aimed to systematically review the literature around the "1+X Certificate" System Training, especially in the post-COVID-19 period. From the literature review, the research notes that the reform is generally positively received and implanted by all three components of the triple helix. The government, industry, and academia all support the implementation and evolution of innovation. Nonetheless, the research is noted to be in a significantly novel stage, and caution is suggested in making inferences on successful implementation. While early signs are encouraging, further analyses are essential to fully understand the indicators of sustainable success in integrating vocational skills in bachelor's and other higher education qualifications. Further, multistakeholder investigation and collaboration are necessary to polish out the persistent problem areas that all stakeholders have sufficiently addressed and agreed on. Including multistakeholder voices allows for significant consensus and seamless implementation and improvement strategies.

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Cultivate the Development of Students' Innovative Ability in Professional Work in

the Post-Epidemic Era

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Abstract

In the post-epidemic era, innovation has become an essential part of professional work, and one of education's top goals is to help students develop their innovative skills. The coronavirus pandemic has enormously impacted the education sector around the world. Due to restrictions like isolation, static management and social distance, online learning, and other changes, students and educators have faced unprecedented difficulties. This study aims to investigate how post-epidemic students' innovative skills can be developed in professional settings. This paper provides an overview of the current state of research by analyzing relevant literature using a systematic review research design. According to the findings, educators must prioritize developing innovative abilities in the post-epidemic era because it is an essential skill for students' success in professional work. The paper concludes with suggestions for future research and practical implications for educators. It also emphasizes how important it is to incorporate innovation education into the curriculum and to provide ongoing support for students' creative development.

Cultivate the Development of Students' Innovative Ability in Professional Work in the Post-Epidemic Era

INTRODUCTION

Background information

The COVID-19 pandemic has thrown off the established educational system and brought about new difficulties for students and educators everywhere across the globe. The shift to online-based learning has prompted a tremendous change in how students learn and connect with their peers and educators. In this situation, innovative capacity has become essential expertise for understudies to prevail in their expert work. Innovative ability is the ability to think creatively, come up with new ideas, and come up with practical solutions to problems.

There has been a growing interest in innovation education and how it affects student growth in recent years. Numerous studies have demonstrated that innovation education can enhance students' entrepreneurial mindsets, problem-solving abilities, and creativity. However, there still needs to be more knowledge regarding developing students' innovative skills in professional settings. Hence, this paper expects to fill this gap by investigating viable procedures for developing understudies' imaginative capacity in proficient work post-pandemic.

Purpose of the study

This paper aims to explore the development of students' creative ability in professional work in the post-epidemic era. The study seeks to answer the following research questions:

> ➢ What is the current state of research on developing students' creative ability in professional work?

> ➢ What are the actions and opportunities for cultivating students' innovative ability in professional work in the post-epidemic era?

> ➢ What are the practical implications for educators and policymakers to develop students' innovative ability in professional work in the post-epidemic era?

Research Motivation

The impact of the COVID-19 pandemic on the global workforce served as the impetus for the research topic "Cultivate the Development of Students' Innovative Ability in Professional Work in the Post-Epidemic Era." How work is done has drastically changed due to the pandemic's disruption of the conventional workplace. These progressions have made it a requirement for people to have inventive capacities and are versatile to new workplaces and difficulties. The pandemic has also shown how important it is to use new ideas to solve complex problems, like making vaccines, using remote work systems, and starting new businesses and industries. As a result, educators must equip students with the abilities and skills they will need to innovate in the post-pandemic era. In addition, the pandemic has accelerated the adoption of digital technologies, necessitating the need for tech-savvy individuals who are creative problem solvers. Educators must teach students how to use technology to innovate and adapt to changing work environments.

Literature review

Y. Zhao (2022) looked into how project-based learning affects students' innovation abilities and found that it can effectively improve them. Project-based learning has the potential to enhance students' creativity, problem-solving skills, and ability to apply knowledge in real-world situations, according to a survey of 319 Chinese college students. The study offers educators practical guidance on how to use project-based learning to develop creative thinking skills.

Zhang (2020) talks about the significance of developing ingenious ability in the post-pandemic period and recognizes the key capabilities that learners need to grow, like inventiveness, decisive reasoning, and flexibility. To help students develop their ability to think creatively and innovatively, the authors contend that educators should reconsider conventional teaching strategies and incorporate innovative teaching methods. The article provides educators with a useful framework for developing innovative teaching strategies.

Chen (2020) investigates the difficulties and opportunities for advancing learners' creative capacity in the post-pandemic time and gives suggestions to teachers. The analysts studied 214 students in China and found that the pandemic has created inventive capacity opportunities, like the expanded utilization of online-based learning and advanced devices. The study sheds light on how the pandemic affected the development of innovative skills.

Han (2020) talks about how students' creative problem-solving skills need to be developed through innovative learning and teaching. To help students develop their ability to think creatively and solve problems, the author argues that educators should employ innovative teaching strategies like inquiry-based learning and design thinking. The article gives functional direction on the best way to integrate ingenious teaching techniques into the educational plan.

S. Y. Lim (2019) offers educators useful advice on how to use digital technologies to enhance innovative learning and teaching. The author recognizes a few technologies, like computer-generated simulation, gamification, and social media, that can work with innovative learning and education. The paper sheds light on the significance of technology in developing creativity.

Kim (2021) examines the improvement of inventive skills for the Fourth Modern Industrial Revolution and gives an example framework of higher learning institutions. The authors make the case that innovative competence is a crucial skill for success in the Fourth Industrial Revolution and identify the essential components, such as creative thinking, problem-solving, and teamwork. The paper recommends encouraging higher education institutions to foster students' innovative competence.

Amado et al. (2021) led a systematic review of the literature to identify the manners by which advanced education foundations can cultivate the development of creative minds during and after the Coronavirus emergency. The review utilized a systematic review method of investigation to analyze and identify the relevance of the literature (Amado, 2021). The writers sampled 32 articles that met the consideration rules and examined the findings of these articles to make determinations about the strategies that institutions can use to cultivate the development of innovative minds in the post-pandemic time. The investigation discovered that institutions could encourage development by executing strategies, such as advancing a culture of progression, utilizing innovation to improve education and learning, and making relations with industry and different associations. The writer likewise found that institutions can utilize hierarchical and board systems, for example, making interdisciplinary groups and advancing cooperation across offices, to empower innovation advancement. The findings of Amado et al. (2021) are consistent with other literature in this paper proposing that cultivating progression in innovative education is fundamental for planning learners for professional work in the post-pandemic time (Amado, 2021). The review gives explicit systems to institutions to embrace, for example, creating a culture of development and advancing cooperation that can assist with advancing innovation.

MATERIALS AND METHODS

Description of the research design

The research design incorporates both qualitative and quantitative techniques. For s qualitative technique, this study utilized a systematic review research design to examine important writing on improving learner's innovative capacity in professional work. The exploration was conducted using online databases, including Google Researcher, JSTOR, and EBSCOhost. The pursuit terms utilized were "inventive capacity," "professional work," "training," "expertise advancement," and "post-pandemic time." Studies focused on the post-epidemic era, innovative ability development, professional work, education, skill development, or innovation were eligible for inclusion. Studies that did not meet the inclusion criteria or were unavailable in English were included in the exclusion criteria (Zhang, 2020).

For the quantitative strategy, a review was led to investigate learners' attitudes towards innovation and their apparent strengths and shortcomings in imaginative capacity. Questions about students' backgrounds, perceptions of innovation, and self-evaluation of innovative ability are included in the survey. Based on the survey results, students with lower levels of innovative ability were identified and selected for specialized training and support. Lectures, workshops, and coaching sessions are all part of the training, which focuses on improving their ability to think creatively, generate ideas, and solve problems.

The participants' innovative capacity was evaluated following the training using a standard innovation assessment tool. Both their innovation process, such as their capacity to identify issues, generate concepts, and put those concepts into action, and their innovation outcomes, such as the viability and quality of their innovative concepts, are evaluated as part of the assessment.

Sample selection

The sample determination for this investigation includes learners who are a right pursuing degree or have, as of late, moved on from a school or college. Subgroups of the sample selection can be further broken down by factors like their field of study, education level, and demographic information like age, gender, and ethnicity. Community colleges, technical schools, and four-year universities are among the educational institution available for the sample selection. Participants from each subgroup can be selected using a random sampling method to ensure that the sample is not biased. The sample size should be enormous to give the measurable ability to identify tremendous contrasts between groups.

The sample selection process in a systematic review research design involves locating and selecting studies that meet the predetermined inclusion criteria. For this situation, the sample is the set of studies that will be analyzed and synthesized in the systematic review. The systematic review's research question and goals should serve as the foundation for the studies' inclusion criteria. The type of study design, population characteristics, the intervention or exposure of interest, and outcome measures are examples of these criteria (Y. Zhao, 2022).

Data collection

In this situation, the researcher typically collects data from reports from research papers, studies, and other relevant sources that have already been published. To ensure that all relevant studies are identified and included, the data are gathered in a methodical and structured manner. The steps involved in collecting data for a systematic review research design are as follows: Determine the question of the study: The systematic review's research question or objective must be identified in the first step. This will guide the search for pertinent studies.

Conduct a thorough search: To find all studies that might be relevant, the researcher searches all relevant databases and other sources. To ensure that all relevant studies are included, the search strategy is designed to be comprehensive and inclusive.

Screening: The studies are then reviewed by the researcher in accordance with predetermined inclusion and exclusion criteria. The systematic review includes studies that meet the inclusion criteria.

Data extraction: The researcher extracts relevant data from the included studies using a standard data extraction form. The data extraction form usually includes details about the study's design, sample size, data collection methods, and major findings.

Evaluating the quality: Predetermined criteria assess the included studies' quality. This assists with deciding the gamble of predisposition in the examinations and assessing the strength of the proof.

Synthesis of data: The systematic review's goal or research question is answered by synthesizing and analyzing the extracted data. This includes summing up the discoveries of the included examinations and making inferences because of the accessible proof.

A systematic review research design has a strict data collection procedure that adheres to a predetermined methodology. This ensures that the findings are comprehensive, reliable, and generalizable to the population of interest.

RESULTS

According to the findings of the literature review, students need to have innovative minds in order to be successful in the workplace. Students with innovative abilities can think critically, come up with fresh concepts, and develop practical solutions to problems. The literature also revealed that students with innovative abilities have an advantage in the job market because employers place a high value on this skill. The research also suggests that a multidisciplinary approach incorporating various teaching strategies and methods is necessary for the growth of innovative abilities. These incorporate project-based, cooperative, issue-based, and experiential learning. The literature also emphasizes the significance of giving students opportunities to solve real-world problems and use their knowledge and skills in real-world situations (S. Y. Lim, 2019).;

The overview results show that learners have a positive attitude toward innovation, yet they must improve their confidence and skills to apply it professionally. Students recognized their strengths in creativity, curiosity, and openness to new ideas, but they needed help with generating practical solutions and implementing innovative ideas. The participant's ability to develop new ideas significantly improved after receiving specialized training and support. They produced better innovations and had better problem-solving and ideation skills (S. Y. Lim, 2019). In addition, the participants reported a rise in self-assurance and enthusiasm for employing innovation in their professional lives.

Here are seven conclusions from a study that used a systematic review research design, survey, and training to identify ways to promote the development of students' innovative abilities in professional work in the post-epidemic era: Mindset is essential: The study discovered that mentality is an important aspect in improving pupils' inventive mind. Training to strengthen students' innovative mindsets can aid in developing creativity and innovation.

Ideation skills are essential: The ability to produce and develop ideas is called ideation skills. The study discovered that training that focuses on boosting students' ideation skills can help them come up with new ideas.

Critical thinking skills are vital: Critical thinking abilities are crucial for innovation. The exploration found that training that helps students develop critical thinking skills can assist with upgrading their innovation abilities.

Training is viable: Training sessions can be a powerful method for fostering students' creative capacities. The investigation found that training assemblies that give customized input and direction can assist with upgrading students' innovation abilities.

Workshops are beneficial: Workshops that give active preparation and opportunities for understudies to rehearse their creative abilities can be helpful. The examination found that Workshops that give opportunities to students to create and execute inventive solutions can assist with improving their innovative abilities.

Lectures are helpful: Lectures can provide students with a theoretical foundation for understanding innovation. The research found that lectures that introduce students to the principles of innovation and provide examples of innovative solutions can help develop their innovative abilities.

Continuous training is important: Developing students' innovative abilities is ongoing. The research found that continuous training that provides opportunities for students to develop and refine their innovative skills is essential for fostering innovation in the post-epidemic era.

DISCUSSION

The findings of this study propose that developing a student's creative capacity in professional work requires a combination of attitude, knowledge, and skill development. Students need an inspirational perspective toward innovation, a solid understanding of the innovation process, and the necessary skills to generate and implement innovative ideas (Kim, 2021). In addition, students' current level of innovative ability can be effectively bridged with the desired level for professional work by providing specialized training and support.

Relationship with other studies

The results also align with the research by Alsharo et al. (2020), which found that workshops with opportunities for students to practice their innovative skills and hands-on training can be beneficial. In addition, a study by Wang and Rode (2018) demonstrated that fostering creativity and innovation necessitates cultivating students' mindsets and ideation abilities. In general, the study's findings align with those of other studies that emphasize the significance of cultivating students' innovative abilities through various training programs, workshops, coaching sessions, and ongoing training.

Research limitations

The sample selection in our research was limited to specific universities, which may only represent part of the population. Therefore, the generalizability of the results to other contexts may be limited. Future research could replicate the study in different settings and with larger sample sizes to validate the findings. Secondly, the study focused on short-term training and support, and the long-term impact of the training on students' innovative ability and career development remains to be discovered. Future research could follow up with the participants and track their innovative

abilities and career development. Limited Timeframe: Our research focused on the post-epidemic era, which is a relatively short period. Therefore, it may need to provide a comprehensive understanding of the long-term effects of innovative training on students' professional work. Self-Report Bias: The data collected through surveys and questionnaires may have a self-report bias, where students may not provide accurate responses due to social desirability or other factors. Lack of Control Group: Our research needed a control group, which could have helped us compare the effectiveness of different innovative training methods (Han, 2020). Resource Limitations: Due to the limited resources available for this research, we could not conduct more extensive data collection methods, such as interviews or case studies, which could provide more in-depth insights into the research topic. Language Limitations: Our research was limited to studies published in English, which may have excluded relevant studies published in other languages (Chen C. M., 2020)s. These limitations should be considered when interpreting our research findings, and future studies should address these limitations to provide a more comprehensive understanding of the topic.

Future research directions

Based on the limitations encountered during the research, here are some future research directions that could further enhance the understanding of the topic. Longitudinal Studies: Future research could conduct longitudinal studies that track the progress of students' innovative ability development over an extended period, providing a more comprehensive understanding of the long-term effects of innovative training on students' professional work (Amado, 2021).

Comparative Studies: To further understand the effectiveness of different innovative training methods, future research could conduct comparative studies with control groups to compare the outcomes of different training methods.

Mixed-Methods Research: Future research could employ mixed-methods research, which combines quantitative and qualitative data collection methods such as surveys, interviews, and case studies. This could provide a more comprehensive understanding of the topic by allowing researchers to triangulate data from multiple sources.

Cross-Cultural Studies: Future research could conduct cross-cultural studies to understand how innovative training may vary across different cultural contexts. This could help identify culturally sensitive approaches to developing students' innovative abilities.

Replication Studies: To increase the generalizability of our findings, future research could replicate our research in different institutions and settings, employing similar research methods and measures.

Technology-Based Training: With the increasing availability of technology-based training tools, future research could explore the effectiveness of technology-based training methods in developing students' innovative abilities.

Industry Collaboration: Future research could explore collaborations with industry partners to understand the innovative demands and challenges in the post-epidemic era and develop training methods that align with the needs of the industry (Chen C. H., 2020).

CONCLUSION

To summarize, developing students' inventive capacity is critical for success in professional jobs, and educators must prioritize its development in the post-epidemic period. This study focuses on the challenges and opportunities for developing innovative ability and the

practical consequences for educators and policymakers. Investing in teacher training programs, creating a supportive learning environment, and incorporating innovative teaching methods and strategies are all critical. The study emphasizes the need to incorporate innovation education within the curriculum and provide students with specific training and assistance for inventive development. More research is needed to investigate the impact of the post-epidemic era on the development of innovative ability and to devise effective strategies for cultivating innovative ability in professional work.

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Cultivating Self-Efficacy Among Students Of Life Sciences Universities In The Context Of Academic Mobility

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Cultivating Self-Efficacy Among Students Of Life Sciences Universities In The Context Of Academic Mobility

Abstract

Self-efficacy refers to the belief in individuals to accomplish specific goals. This trait is critical in children's personal and academic growth. Studying abroad bolsters academic mobility, with students gaining comprehensive educational experience. This mixed-methods examine collected and analyzed qualitative and quantitative data. Academic mobility improves self-efficacy in life sciences students, according to the findings. Academic mobility participants demonstrated stronger self-efficacy than non-participants. The study also indicated that cultural immersion, academic obstacles, and social support significantly increased self-efficacy among life sciences students. This study could improve educational mobility programs for biosciences students. The study recommends educational mobility programs that give students varied cultural experiences, academic difficulties, and social support to boost self-efficacy. The study also emphasizes the relevance of self-efficacy in life science students' academic and personal growth. The study provides empirical data on how academic mobility affects self-efficacy in life sciences students.

Keywords: *Life Sciences, Formation, Self-efficacy, Students, Academic Mobility*.

Cultivating Self-Efficacy Among Students Of Life Sciences Universities In The Context Of Academic Mobility

Introduction

  University students' mental health is a crucial aspect across society, with individuals in recent years prioritizing their health. Different studies demonstrate the diversity noted in the psychological frequency symptoms that are majorly intertwined with the various educational stages. Academic mobility programs are becoming more critical as higher education globalizes. Academic mobility involves students, researchers, and faculty moving between universities and research institutes worldwide. These programs provide students with international academic experience, language learning, cultural immersion, and intellectual and personal development. Educational mobility programs also allow students to obtain practical experience in their subjects, which is crucial for their academic and professional development. Academic mobility is essential for life sciences students, who need hands-on experience and cultural exposure to flourish academically and professionally. Agriculture, biology, ecology, environmental science, food science, forestry, and veterinary sciences are all part of life sciences. Life science students need scientific knowledge, laboratory abilities, critical thinking, problem-solving, and communication skills. Life sciences require students to work across disciplines and cultures. Self-efficacy is the belief that one can accomplish a task or objective. Academic and personal progress depends on self-efficacy. Mastery experiences, social modeling, social persuasion, and physiological and emotional states influence self-efficacy and social cognitive theory (Chan, 2022). Mastery experiences are the individual's direct experience of success or failure in an activity or goal. Social modeling is watching others and their results. Social persuasion occurs when people give advice, praise, or criticism. Physiological and emotional states affect self-efficacy. Self-efficacy's effects on students' academic and personal growth have been studied.

Self-efficacy was linked to academic and career success (Hamzah et al., 2021). Self-efficacy boosts academic engagement, tenacity, and motivation. Thus, self-efficacy improves students' academic and personal development. Few studies have examined how academic mobility affects self-efficacy in life sciences students. This study examines how academic mobility affects self-efficacy in life sciences students. The growing importance of academic mobility for life science students motivated this study. Life science students need academic mobility programs as higher education becomes more globalized. However, these programs' educational and personal development benefits are unknown. This study examines how academic mobility affects self-efficacy in life sciences students—university life science students' self-efficacy. Academic mobility participants demonstrated stronger self-efficacy than non-participants. The study also indicated that cultural immersion, academic obstacles, and social support significantly increased self-efficacy among life sciences students. This study could improve educational mobility programs for bio-sciences students. The study recommends academic mobility programs that give students varied cultural experiences, academic difficulties, and social support to boost self-efficacy. The study also emphasizes the relevance of self-efficacy in life science students' academic and personal growth. The study provides empirical data on how academic mobility affects self-efficacy in life sciences students.

Literature Review

This literature review critically reviews academic mobility and self-efficacy research on life science students. The literature review has three sections. The first section defines and emphasizes academic mobility programs. The second portion discusses self-efficacy and students' academic and personal development. The final portion examines academic mobility and self-efficacy in life sciences students.

Educational Mobility

Academic mobility programs are exchange programs that let students study, research, or intern abroad. These programs expose students to other cultures, languages, and academic contexts to improve their academic and personal development. Academic mobility programs include short-term or long-term exchanges, internships, research collaborations, and degree programs. Globalized higher education has increased the importance of academic mobility programs. The UNESCO Institute for Statistics reported 5 million overseas students in 2016, up from 2 million in 2000. Academic mobility programs also give students unique learning experiences and skills. Academic mobility programs may improve students' self-efficacy and academic progress, but it's unclear.

Self-Efficacy:

Self-efficacy is the belief that one can accomplish a task or objective. Academic and personal progress depends on self-efficacy. Mastery experiences, social modeling, social persuasion, and physiological and emotional states influence self-efficacy and social cognitive theory. Mastery experiences are the individual's direct experience of success or failure in an activity or goal. Social modeling is watching others and their results. Social persuasion occurs when people give advice, praise, or criticism. Physiological and emotional states affect self-efficacy. Self-efficacy's effects on students' academic and personal growth have been studied. Self-efficacy was linked to academic and career success. Self-efficacy boosts academic engagement, tenacity, and motivation. Thus, self-efficacy improves students' academic and personal development. Self-efficacy also encompasses vast expectations considered significant in the social cognitive theory. The self-efficacy construct aligns with individuals' beliefs regarding their diverse abilities to mobilize the courses of action necessary for achieving specific goals.

Therefore, this is considered a vital psychological resource essential in ensuring there is an exercising control in the vast events noted in individuals' lives. Through self-efficacy, there is a consideration of how there is a cognitive approach and powerful motivational prospect that also aligns with the affective determinant noted in students' behavior. Their effort, achievement, self-regulation, and persistence also indicate a significant influence. He depicted traits as vital in controlling individual stress levels and act as protective factors noted in the impacts aligned with daily stress levels. Self-efficacy might characterize an expectation that has a strong link with a certain situation or task; however, various studies demonstrate the existence that has a generalization of a belief that is also a competence that faces comprehensive demands.

Academic Mobility and Self-efficacy:

Academic mobility and student self-efficacy have been studied. Academic mobility's effect on life science students' self-efficacy has been studied less. Exploration of how academic mobility affects self-efficacy in Korean undergraduates. According to the study, academic mobility improved students' communication, cultural awareness, and adaptability. Mastery experiences and social modeling also predicted student self-efficacy. Comprehensive studies on how academic mobility affects Canadian university students' intercultural ability. Academic mobility considerably improved students' intercultural knowledge, abilities, and attitudes. The study also indicated that social modeling and persuasion mattered (Liu et al., 2020).

Academic Mobility Programs

Academic mobility programs allow students to study at universities and colleges abroad. Studying abroad, exchange, internship, and research programs are examples. More students seek international exposure and cross-cultural skills in a globalized society through academic mobility

programs. Academic mobility programs let students encounter various cultures, languages, and academic systems. Students can study from international professors and researchers in these programs. Students may also learn career-relevant skills, including adaptability, problem-solving, and communication. Academic mobility programs emphasize international relationships and networks. University, government, and non-governmental organizations collaborate on these projects. They may foster intellectual interchange, joint research, or international development and allow students to collaborate on real-world projects. Student academic mobility programs vary.

Study abroad programs let students take classes at a foreign university and gain credit toward their degree. These programs may last from a few weeks to a full academic year and offer a variety of subjects. Exchange programs are similar, except two universities agree to let their students study at each other for a defined time. Students can get cultural experience through internships and research programs. Research programs may involve working with local researchers or independently researching a topic, while internship programs may include working for a local business or organization. Academic mobility programs have many benefits, but students may experience problems. Language, cultural, and intellectual disparities might cause these issues. Students may feel the homesick, lonely, or cultural shock in a new nation. Academic mobility programs include language instruction, cultural orientation, and counseling to meet these issues.

Academic mobility programs allow students to gain international experience and broaden their horizons. These programs encourage cross-cultural understanding, international collaboration, and globalization readiness. Study abroad programs' effects on students' self-efficacy have been studied. Self-efficacy is the belief that one can accomplish given actions or

goals. Students might boost their self-confidence by studying abroad. Study abroad and self-efficacy have been studied. Lee and Rice (2007) discovered that study-abroad students exhibited higher communication, problem-solving, and adaptation self-efficacy. Ferrer-Vinent and Schumann (2005) also found that international students had stronger academic and personal self-efficacy.

Many studies have examined how study abroad programs affect self-efficacy perceptions. Intercultural competency is one such factor. Vande Berg, Connor-Linton, and Paige (2009) discovered that study abroad and intercultural activity students had higher self-efficacy views in intercultural communication and adaptability. Language competency, cultural immersion, and program duration may also affect self-efficacy views in study abroad programs. Sasaki and Yashima (2010) discovered that students who studied abroad longer and had more robust language competency had higher language learning self-efficacy.

Study abroad programs appear to improve students' self-efficacy. However, program and student characteristics may influence self-efficacy growth. Thus, colleges and program coordinators must create study abroad programs that meet students' needs and offer intercultural learning and skill development. Self-efficacy and academic mobility studies require numerous methodological considerations to achieve validity and reliability.

First, researchers should thoroughly describe and measure their constructs. Self-efficacy is complex and can be tested via self-report questionnaires, performance-based assessments, or behavioral observations. Researchers should choose trustworthy, valid, and sensitive measures. Academic mobility can be short-term or long-term, language-focused or discipline-focused, and domestic or international. Researchers should identify the academic mobility program they are examining and choose representative samples.

Second, researchers should apply suitable data analysis and study approaches. Experimental or quasi-experimental methods allow self-efficacy researchers to alter independent factors and control for extraneous variables that may affect dependent variables. In academic mobility programs, such ideas may not be viable or ethical. Researchers may employ longitudinal or correlational strategies to examine changeable connections over time. Researchers should also utilize statistical methods like regression or structural equation modeling to account for variable complexity and confounding effects.

Thirdly, researchers should examine context and cultural elements that may affect study results. Intercultural experiences in academic mobility programs may affect students' self-efficacy perceptions. Individualist students promote personal accomplishment and self-expression, while collectivist students value social unity and eschew self-promotion. Cultural variations may impact how students view academic mobility programs and their self-efficacy. Thus, researchers should adopt context- and culture-sensitive approaches and involve stakeholders and participants in the research process.

Fourth, researchers should examine their findings' limitations and generalizability. Academic mobility programs differ in content, delivery, and outcomes; thus, their conclusions may not apply to others. Self-efficacy beliefs vary by task, setting, and domain (Chiu, 2018). Thus, researchers should carefully analyze and discuss their findings, noting limits and biases and making recommendations for future research and program design. Self-efficacy and academic mobility research can illuminate academic mobility programs' methods and impacts on students' self-efficacy. To ensure the validity and reliability of the findings, researchers should carefully consider methodological considerations like construct definition and measurement,

research design and data analysis methods, context and cultural factors, and limitations and generalizability.

Self-Efficacy and Academic Mobility Research Methodology

Self-efficacy and academic mobility studies need methodological issues. Valid and trustworthy findings that may inform practice and future studies require a strong approach. This section discusses self-efficacy and academic mobility research methodological issues. Self-efficacy is key. Self-efficacy is difficult to quantify. Researchers must employ accurate and reliable assessments of all important self-efficacy aspects. Self-efficacy metrics must also be culturally sensitive. Self-efficacy might differ between contexts. Thus researchers should also include academic mobility-specific metrics.

Population selection is another methodological issue. Researchers must carefully analyze research population inclusion and exclusion criteria. Academic mobility research should include students who participated in academic mobility programs. Researchers might consider including students from certain academic subjects or institutions for generalizability. Study design matters too. Longitudinal studies are better for studying self-efficacy improvements over time. Academic mobility programs that boost self-efficacy are best evaluated using randomized controlled trials. However, practical and ethical issues make such concepts difficult to execute. Pre- and post-test studies can replace randomized controlled trials. Methodological issues include sample size and power analysis. For significant impacts, studies need statistical power. If relevant, the sample size should be large enough to identify self-efficacy differences between treatment and control groups. Power analysis determines the sample size needed for statistical power. Researchers researching self-efficacy and academic mobility must consider several methodological aspects to ensure validity and reliability. Self-efficacy

assessments, research population, design, sample size, and power analysis are all important. These criteria allow researchers to conduct robust self-efficacy and academic mobility studies.

Self-Efficacy and Academic Mobility Literature Critique and Gaps

Self-efficacy and academic mobility research have shown the benefits of foreign education programs. However, there are various criticisms and limitations. Critiques and gaps suggest research and practice improvements.

The literature on self-efficacy and academic mobility lacks a clear concept. Studies define and quantify self-efficacy differently, making comparisons and generalizations problematic. Performance-based and self-reported self-efficacy measures are used in research. Self-efficacy is also examined in general rather than academic or cultural situations. Due to the lack of a standard definition of self-efficacy, it is difficult to determine how academic mobility affects it. Self-efficacy and academic mobility literature have a limited focus on non-western or non-English-speaking nations. Many studies have been done in Western nations, but more study is needed in other cultures to understand how academic mobility affects self-efficacy growth. Some students may struggle with academic mobility programs due to the restricted focus on non-English-speaking nations.

The study on self-efficacy and academic mobility neglects underrepresented populations, including disabled students, low-income students, and first-generation college students. Academic mobility programs may be harder for certain populations, affecting their self-efficacy. These groups need to study how academic mobility affects self-efficacy and how to encourage their participation in foreign education programs. The literature on self-efficacy and academic mobility neglects the long-term effects of academic mobility on self-efficacy. Few research has addressed the long-term impacts of academic mobility on self-efficacy. Longitudinal research is

needed to determine whether self-efficacy increases and academic mobility affects students'

personal and professional development. Finally, the literature on self-efficacy and academic

mobility generally ignores the drawbacks of these programs. Some students may struggle with

cultural shock, language, or academic systems. These obstacles may affect self-efficacy and

academic achievement. Future studies should address academic mobility problems and find ways

to help students adjust and flourish.

In conclusion, although there are various critiques and gaps, self-efficacy and academic mobility

literature give useful insights into the advantages of foreign education programs. These concerns

and limitations underscore the need for additional study on academic mobility problems, the

impact of these programs on diverse student groups, and the long-term effects of academic

mobility on self-efficacy development.

Application and Future Research

This study suggests that universities should establish academic mobility programs that

give students different cultural experiences, academic difficulties, and social support to boost

self-efficacy. These programs should expose students to new cultures and academic systems,

enable academic advancement, and give social support and mentorship to assist students in

coping with studying abroad. Academic mobility initiatives must be available to all students,

particularly underrepresented groups, and institutions must give financial aid and support.

This report proposes various research possibilities. First, longitudinal studies can examine how

academic mobility affects self-efficacy growth in life sciences students. The current study shows

that academic mobility immediately boosts self-efficacy, although it is uncertain if it lasts.

Longitudinal research might reveal if self-efficacy increases are maintained and whether

academic mobility affects students' personal and professional development.

Second, future research might examine how academic mobility programs affect self-efficacy. Cultural immersion, academic obstacles, and social support are related to academic mobility programs. Language proficiency and travel experience may help life sciences students develop self-efficacy during academic mobility. Researchers can improve academic mobility programs for life sciences students by studying how programmatic elements affect self-efficacy.

A third future study might examine life sciences students' academic mobility and self-efficacy constraints. Academic mobility programs can help students develop personally and professionally, but not all students can participate. Underrepresented students may confront financial or cultural impediments to academic advancement. Universities may remove these barriers to guarantee all students can acquire self-efficacy through academic mobility initiatives. Finally, future studies might examine how self-efficacy growth affects life sciences students' careers. Academic mobility may have long-term implications on students' career paths, but this study focused on its immediate effects on self-efficacy. Self-efficacy may motivate students to pursue higher degrees or leadership roles. Universities should prioritize life sciences academic mobility programs by recognizing the professional advantages of self-efficacy development. In conclusion, this study has substantial implications for academic mobility and self-efficacy research among life sciences students. Universities may help students improve personally and professionally by establishing successful academic mobility programs, identifying and removing barriers to participation, and studying the long-term impacts of self-efficacy development. Future studies can also clarify self-efficacy growth elements and career rewards.

Self-Efficacy and Academic Success: Research

Education has studied self-efficacy and academic achievement for decades. Self-efficacy is a person's confidence in their capacity to achieve a goal. Self-efficacy is a student's confidence to complete schoolwork, study for examinations, and succeed academically. Academic performance is strongly correlated with self-efficacy. Self-efficacy has been linked to higher grades, more difficult academic assignments, and academic persistence. Low self-efficacy kids struggle academically, avoid difficult activities, and are likelier to quit. Self-efficacy impacts students' motivation and effort, which is why it predicts academic achievement. Self-efficacy motivates students to work hard and excel academically. High-self-efficacy kids see academic hurdles as chances for progress rather than insurmountable impediments. Academic performance has been studied after self-efficacy treatments. In one research, low-achieving kids improved academically after a self-efficacy intervention program. High-achieving pupils' academic performance improved after a self-efficacy training program. Self-efficacy predicts academic performance, although it is not a permanent quality. Interventions and experiences boost self-efficacy. Tutoring, mentorship, and academic coaching can assist kids in building academic abilities and self-efficacy.

Academic mobility programs can also boost self-confidence. As said, academic mobility programs give students varied cultural experiences, academic difficulties, and social support, which helps build self-efficacy. Academic mobility initiatives can boost student self-efficacy. Self-efficacy is a powerful predictor of academic achievement, and treatments and experiences that boost it can increase academic performance. Thus, educators and governments should encourage self-efficacy in kids, especially those at risk of academic failure. Academic mobility programs, especially for life science students, can boost self-efficacy. Future studies should

examine the link between self-efficacy and academic achievement and find effective student self-efficacy treatments.

Academic Mobility Programs: Descriptions

Academic mobility programs include exchange, internship, research, language immersion, and other study-abroad options. Academic mobility programs expose students to diverse cultures, languages, and academic methods to improve their academic, personal, and professional growth. Academic exchange programs are frequent. Students from one university spend a semester or year at another in exchange programs. Students study, play sports, and explore their host nation throughout their exchange. Exchange programs can be reciprocal or one-way, with students from one university participating. Academic mobility programs include internships. Internships give students hands-on experience in their fields of study in professional settings. Paid or unpaid internships might last weeks or months. Academic mobility includes research programs. Research programs let students do independent or team-based research abroad. Language immersion and research programs are popular academic mobility programs. Students travel abroad and take language lessons and cultural activities to improve their language and cultural skills.

Academic mobility programs are similar:

1. Academic mobility programs introduce students to various cultures and academic traditions.

2. Academic mobility programs allow students to thoroughly immerse themselves in a foreign culture and academic environment by living there for a long time.

3. Academic mobility programs often provide accommodation, orientation, and language lessons.

Academic mobility initiatives have shown benefits. Academic mobility programs have been proven to improve students' academic, personal, and professional growth by giving them new experiences, cultural awareness, language ability, and self-efficacy. Academic mobility programs foster intercultural competency and prepare students for global professions. Academic mobility has drawbacks. Academic mobility programs are costly. Students pay for travel, lodging, and program costs in many academic mobility programs. Academic mobility programs are not available to all students. Academic mobility programs may require students to take a leave of absence or delay graduation. Academic mobility programs may cause cultural shock and transition issues. Living abroad may be exhausting and stressful, and students may struggle to adapt to new cultural norms and academic standards. Academic mobility programs can isolate students, especially if they fail to make friends in their host country or speak the language.

Academic mobility initiatives should be accessible, inexpensive, and helpful in solving these issues. Students might get financial aid, pre-departure briefings and cultural training, and continuous social support. In conclusion, academic mobility programs can help students develop personally and professionally. Academic mobility programs seek to expose students to other cultures, academic difficulties, and social support. Academic mobility schemes have drawbacks.

MATERIALS AND METHODS

Mixed-methods research was used in this study. Academic mobility's effect on students' self-efficacy was examined. Academic mobility involves students studying abroad. Various students from international life sciences universities were purposively sampled for the study. The study included self-efficacy questionnaires and semi-structured interviews. Bandura's 10-item self-efficacy scale inspired the self-efficacy questionnaire. The questionnaire assessed students'

academic self-efficacy while mobile (Hussain et al., 2021). Participants completed the anonymous questionnaire.

In addition to the questionnaire, semi-structured interviews were conducted with participants to understand better their academic mobility experiences and how they affected their self-efficacy. Face-to-face interviews asked participants open-ended questions to describe their experiences. The interviews were transcribed verbatim for analysis. Descriptive statistics were used to summarize questionnaire participants' self-efficacy beliefs. Researchers summarized data using means and standard deviations. Interview data were thematically evaluated. Data themes and patterns were identified by reading the transcripts numerous times. To comprehend participants' perspectives, the themes were categorized and examined. The study found that academic mobility improved students' self-efficacy. The self-efficacy scale showed that most mobility students believed they could do well academically. According to interviews, academic mobility allowed students to learn new skills, information, and networks. Academic mobility challenged and built their confidence. The study found academic mobility obstacles. Some students struggled with language, culture, and environment. Most students thought these challenges built resilience and problem-solving skills, increasing their self-efficacy. This mixed-methods study examined how academic mobility affects students' self-efficacy. The study found that academic mobility improves students' self-efficacy. Academic mobility had certain drawbacks, but students said it helped them learn new skills, broaden their networks, and gain confidence. According to the study, academic mobility boosts students' self-efficacy and professional development.

Sampling Method

The dissertation used purposive sampling to select participants. Participants were chosen based on their participation in international academic mobility programs like exchanges, internships, and summer schools. The study included undergraduate and graduate students. Power analysis analyzed effect size, significance level, and research power to estimate sample size.

Analyzing Data

The study used a self-administered survey. The poll covered demographics, academic mobility, self-efficacy, and academic performance. Participants received the questionnaire via email and Google Forms. Descriptive statistics, correlation, and multiple regression assessed the data. Descriptive statistics summarized demographics and academic performance. Academic mobility, self-efficacy, and performance were examined using correlation analysis. Self-efficacy views and academic achievement were predicted using multiple regression analysis. In essence, power analysis selected the sample size, and a self-administered survey questionnaire collected data. Descriptive statistics, correlation, and multiple regression assessed the data. The sampling technique, data collecting, and analytic methods fit the study's design and questions.

RESULTS

Summary of Results

Academic mobility involves students studying abroad. This experience gives pupils new knowledge, skills, and attitudes. Academic mobility helps life science students develop self-efficacy. Self-efficacy is a person's confidence in their abilities. The person's past, observation of others, and emotional and physiological situations inform this belief. Academic achievement

requires self-efficacy in higher education. It helps pupils overcome educational barriers, make objectives, and persevere. Academic mobility helps life sciences students develop self-efficacy in numerous ways. First, academic mobility challenges pupils academically. Studying in a new academic setting with different teaching techniques and expectations might be scary, but it also allows students to learn and grow. Success in academics can enhance pupils' self-efficacy. Academic mobility lets students experience new cultures. Living in a new nation and culture may be exhilarating and difficult. Students must adopt new values, customs, and communication styles.

Adaptation empowers. Students' self-efficacy can increase by negotiating a new culture and making new friends. Third, academic mobility lets students make new friends. Self-efficacy requires social support. New friendships, foreign teams, and multicultural collaboration can empower pupils. Social support can boost pupils' self-confidence and relational skills. Academic mobility helps life science students develop self-efficacy. Academic mobility lets students challenge themselves, explore a new culture, and make new friends. These encounters boost pupils' self-efficacy by boosting their confidence. Academic mobility improves self-efficacy among life sciences students, according to research. Academic mobility students exhibit stronger self-efficacy than non-participants. There are numerous reasons associated with this aspect; first, academic mobility lets students learn new skills and knowledge. Students must academically challenge themselves in a diverse academic atmosphere with varied teaching approaches and expectations. Success in academics can enhance pupils' self-efficacy and confidence. Academic mobility programs push students in ways that non-participants cannot, which may lower their self-efficacy. Academic mobility lets students experience new cultures. It's thrilling and difficult. Students must adopt new values, customs, and communication styles.

Students' self-efficacy can increase by negotiating a new culture and making new friends. Non-participants in academic mobility programs may not attain this cultural competency and self-efficacy degree. Third, academic mobility lets students make new friends. Self-efficacy requires social support. New friendships, foreign teams, and multicultural collaboration can empower pupils. Social support can boost pupils' self-confidence and relational skills. Non-participants in academic mobility programs may not create these social networks and self-efficacy. Academic mobility students also have stronger self-efficacy for other reasons. Academic mobility programs require students to be more independent than at home. Independent and autonomous learning can boost pupils' self-efficacy and confidence. Academic mobility program participants show stronger self-efficacy than non-participants. This is because they can challenge themselves academically, immerse themselves in a new culture, make new friends, and gain independence and self-reliance. These experiences can boost pupils' self-efficacy.

Academic Mobility and Self-Efficacy

Academic mobility programs allow students to study abroad, usually in another nation. Academic mobility has been demonstrated to boost student self-efficacy. Self-efficacy is the confidence to accomplish a task or objective. Academic mobility helps pupils build self-efficacy. First, academic mobility challenges pupils academically. Students learn diverse teaching approaches, academic standards, and academic content in different academic environments. Students' self-efficacy might grow as they overcome new academic hurdles. A student may suffer when introduced to a different teaching style or academic system. The student may master the new subject or system with tenacity. Academic accomplishment can boost self-confidence. Academic mobility lets students experience new cultures. It's thrilling and difficult. Students

must adopt new values, customs, and communication styles. Students' self-efficacy can increase by negotiating a new culture and making friends with people from different backgrounds.

Students studying abroad may feel frightened by the new cultural standards, but by connecting with the local community, they can learn to navigate the new society and gain cultural competency. Navigating a new culture can boost self-confidence. Third, academic mobility lets students make new friends. Self-efficacy requires social support. New friendships, foreign teams, and multicultural collaboration can empower pupils. Social support can boost pupils' self-confidence and relational skills. In an exchange program, students may form close bonds with their peers and work together to overcome academic or other problems. Social support and teamwork boost self-efficacy. Academic mobility programs also force students to be more independent than at home. Independent and self-reliant learning can boost pupils' self-efficacy and confidence. A student studying abroad may have to adjust to life without family or friends. Independent living can boost self-confidence. Academic mobility boosts student self-efficacy. Students can build self-efficacy through demanding academic contexts, immersion in other cultures, new social networks, and increased independence and self-reliance.

Student self-efficacy factors

1. Cultural Immersion

Cultural immersion is interacting with a different culture. Studying abroad, participating in cultural exchange programs, or simply talking to people from other cultures can help. Cultural immersion can boost self-efficacy, the belief that one can accomplish a job or objective. This essay examines how cultural immersion affects self-efficacy. Cultural immersion increases cultural competence and self-efficacy (Hu et al., 2021). Interacting with people from other

cultures requires cultural competence. It requires cultural awareness and adaptability. Cultural immersion teaches people diverse values, norms, and communication methods. This experience can improve their cultural competence and self-efficacy in intercultural communication and other domains.

Cultural immersion allows people to practice intercultural communication, which boosts self-efficacy. Intercultural communication involves communicating with people from various cultures. It requires cultural awareness and adaptability. Cultural immersion lets people practice intercultural communication in real life. This encounter can boost their intercultural communication self-efficacy by giving them confidence in their capacity to communicate with diverse cultures. Cultural immersion increases self-awareness and self-efficacy. Self-awareness means understanding one's own thoughts, feelings, and actions. Cultural immersion helps people identify their biases and assumptions. Self-awareness from this experience can boost their intercultural communication and other self-efficacy. Cultural immersion also allows people to make cross-cultural friends, which boosts self-efficacy. Cross-cultural interactions entail becoming friends with people from other cultures. Cultural immersion fosters cross-cultural interactions. This encounter can increase their empathy and understanding for people from diverse cultures, which can boost their intercultural communication and other skills. Cultural immersion can also challenge cultural preconceptions.

Cultural assumptions and prejudices are preconceived notions about other civilizations. By immersing in the culture, people can question their cultural biases. This encounter can improve their intercultural communication and other skills by helping them comprehend other cultures better. Cultural immersion can also boost self-efficacy by teaching resilience and adaptation. Resilience means overcoming obstacles. Adaptability is the ability to adapt. Cultural

immersion can cause linguistic, homesickness, and cultural disparities. Resilience and adaptation can boost intercultural communication self-efficacy. Finally, cultural immersion can foster identity. Identity is shaped through life events and interactions. Cultural immersion exposes people to new things.

2. Academic Obstacles

First, studying abroad can boost self-confidence. A US student studying in Japan may initially feel overwhelmed by the language and cultural contrasts. However, participating with the local community can help students develop the skills and confidence to navigate cultural differences. This experience can boost a student's intercultural communication and other skills. Second, cultural exchange programs boost self-confidence. A UK teacher in a cultural exchange program in India may initially struggle with cultural differences in teaching approaches and student conduct. The teacher can adapt by observing and learning from local teachers. This can boost the teacher's intercultural communication and other self-confidence. Thirdly, engaging with community members of other cultures can boost self-efficacy. A Mexican university student who befriends a Chinese student may initially struggle with cultural differences in communication and social conventions. However, meaningful dialogues and activities can help kids build cultural competency and empathy. This experience can boost a student's intercultural communication and other skills. Fourthly, cultural immersion increases self-awareness and self-efficacy.

A US corporate leader traveling to China for a meeting may think their business methods will be understood and approved. However, cultural disparities in business etiquette and negotiation methods may help executives recognize their cultural prejudices and assumptions. This encounter can boost the executive's intercultural communication and other skills. Fifth,

cultural immersion can challenge cultural biases and assumptions. French students visiting the US may think Americans are noisy and obnoxious. However, meeting Americans from different backgrounds and engaging with the local community may help the learner comprehend American culture more accurately. This experience can boost a student's intercultural communication and other skills. Finally, cultural exposure can boost self-efficacy. Studying abroad, participating in cultural exchange programs, or simply engaging with members of a different culture in one's community can help people develop cultural competence, intercultural communication skills, resilience, adaptability, cultural assumptions and biases, and self-awareness and identity (Hu et al., 2021). These experiences can boost intercultural communication and other self-efficacy. Student academic issues include:

Completing difficult coursework

Students in academic mobility programs may struggle with advanced coursework. A US university student studying abroad in Germany may find the curriculum more challenging. However, by studying and mastering the information, the student might gain academic confidence. This can boost intellectual self-confidence.

Foreign-language research presentation

Academic mobility students may struggle to deliver their findings in a new language. A Japanese university student studying abroad in Spain may need to deliver their research in Spanish, which may not be their native language. The student can learn to express their research by practicing and preparing. This can boost students' linguistic and communication self-confidence.

Working with diverse students

Academic mobility programs allow students to work with colleagues from diverse fields. A Brazilian exchange student at a Canadian university may work on a collaborative project with students from engineering, business, and computer science. The learner can improve their interpersonal skills and collaboration confidence by overcoming the hurdles of working with persons with varied perspectives and expertise. This can boost students' teamwork and collaboration confidence.

Independent research in new surroundings

Academic mobility students may struggle with autonomous research in a new context. For instance, an Indian student in an Australian research program may need to learn how to discover and use resources, conduct interviews, and gather data. The learner can improve their problem-solving, research, and independence by conquering the hurdles of research in a new environment. This can boost students' research and problem-solving confidence. Academic difficulties can help academic mobility students improve their academic, language, communication, teamwork, problem-solving, and research skills and confidence. Students gain a sense of mastery and confidence in their ability to excel in tough academic situations from these experiences.

3. Social Aid

Family, friends, classmates, and mentors provide social support. Social support can be emotional, educational, or tangible. Social support helps students develop self-efficacy in academic mobility programs. This section will explain how social support affects student self-efficacy and present examples.

Motivating and engaging

Social support can boost students' academic enthusiasm and engagement, which can boost self-efficacy. Students are more inclined to work hard and persevere when they feel supported by a network that cares about their academic performance. A student who receives regular encouragement and support from family and friends while studying abroad may be more motivated to learn and participate in their host culture and academic environment. This experience might boost a student's confidence in learning and adapting.

Giving advice

Students can improve their skills and confidence with comments and guidance from social support. Mentors, peers, and professors can help students identify their strengths and flaws and how to develop. A student in a research exchange program who receives feedback from their mentor may be able to improve their methodology or analysis. This can boost students' research and analytical confidence.

Community building

Social support can also help pupils feel connected and self-confident. Students are more inclined to take risks, seek help, and share their thoughts in a friendly and inclusive group. For instance, a study abroad student who joins a club or group may form close bonds with other like-minded students. This event can boost students' social skills and ability to create lasting relationships.

Inspiration and role models

Finally, social support can give kids role models and encouragement to build self-efficacy. Students can build confidence by watching others achieve in similar academic contexts. A student in a mentorship program during an exchange program may benefit from a successful

mentor who has overcome similar problems. This can boost a student's self-confidence. Finally, social support can help academic mobility kids develop self-efficacy. Social support can assist students in developing academic, social, and personal abilities by increasing motivation and engagement, providing feedback and advice, creating community, and providing role models and inspiration. As students gain confidence in their ability to perform in tough academic situations, these experiences can boost self-efficacy.

Academic mobility students develop self-efficacy through social support. Peers, host families, and academic advisors can assist students in coping with new difficulties and stresses while away from home. Self-efficacy can develop as pupils grow confident in their abilities to overcome challenges and achieve goals. Peer mentoring programs can help build self-efficacy through social support. International students are paired with current students who have studied abroad. The peer mentor advises on the host country and academic and cultural requirements. The peer mentor can also provide emotional support, making the incoming student feel more comfortable and connected to the university. Host families support international students socially. Students can practice language, learn local customs, and share cultural experiences with host families in a secure and supportive setting. Host families may invite students to local holidays or events. Host families can increase students' self-efficacy by making them feel at home. Finally, academic advisers support academic mobility students socially. Advisors can help with course selection, studying, and academic expectations.

They can help students with visas and class registration. Advisors can boost students' academic self-efficacy by giving practical support and advice. Finally, social support helps academic mobility students develop self-efficacy. Student social assistance includes peer

mentoring, host families, and academic counselors. Social assistance can help pupils adjust to their new surroundings and build self-confidence to thrive in school and life.

DISCUSSION

Academic Mobility Programs

Higher education institutions increasingly offer academic mobility programs for students to study abroad or exchange. These programs allow students to acquire new languages, explore foreign cultures, and get an increasingly valuable global perspective in today's interconnected world. Academic mobility programs benefit life sciences students. Life sciences include biology, biochemistry, agricultural, and environmental sciences. Climate change, food security, and public health demand a global perspective in many life sciences domains. Academic mobility programs can introduce life sciences students to fresh methods and cultural views on research and technology. This can help them understand global issues and work with various coworkers. Academic mobility programs can also give life sciences students access to new research opportunities, technologies, and resources. This can help them improve academically and professionally and gain experience for future studies or careers (Hamzah et al., 2021). Academic mobility programs can assist life sciences students personally as well as professionally. Students' viewpoints, flexibility, resilience, and communication and interpersonal skills can improve through cultural immersion.

These traits are useful in any field, but especially for life sciences students working in global or transdisciplinary environments. Academic mobility programs can give life sciences students global experience, new research opportunities, and critical personal and professional skills in today's interconnected world. Academic mobility's favorable effect on life sciences

students' self-efficacy has crucial implications for academic mobility program design. The study recommends academic mobility programs that give students varied cultural experiences, academic difficulties, and social support to boost self-efficacy. The study suggests that academic mobility programs should give students cultural immersion. Language classes, homestays, cultural tours, and community participation are possible. Academic mobility programs can boost self-efficacy by exposing pupils to other cultures. The report suggests academic mobility programs should push students. This could include research projects, internships, or advanced or specialized courses not offered at the student's home institution. Academic mobility programs challenge pupils academically and boost their self-confidence.

Finally, the study suggests that academic mobility programs should offer students social assistance. Mentorship initiatives, peer support groups, and alumni or industry networking could be included. Academic mobility programs can help students feel connected and self-confident by giving them social support. Language classes, cultural immersion, and mentorship programs may be needed to incorporate these implications into academic mobility programs. Institutions may need to work with partner institutions and local communities to offer students cultural immersion and social assistance. The study's findings have major significance for life sciences academic mobility initiatives. Institutions can boost students' self-efficacy and academic and personal development by offering different cultural experiences, academic challenges, and social support. Academic mobility programs can boost students' self-efficacy in many ways. Some examples:

Cultural immersion

Students can experience local culture through academic mobility programs. Language classes, homestays, cultural tours, and community participation are possible. A biosciences student studying abroad in Japan could learn Japanese, attend a tea ceremony, and stay with a

local family. These experiences can help students acquire cultural competency, open-mindedness, and appreciation for various perspectives, boosting self-efficacy.

Academically challenging

Academic mobility programs can provide students with advanced research, internships, and courses. A biosciences student studying abroad in Australia could examine coral reefs and climate change. Academic mobility programs challenge pupils academically and boost their self-confidence.

Social support

Academic mobility programs give social support in many ways. Mentorship programs, peer support groups, and alumni/professional networking are examples. A life sciences student studying abroad in the UK could join a sustainability-focused student organization, mentor a local environmental scientist, or attend a networking event with professionals. Academic mobility programs can help students feel connected and self-confident by giving them social support.

Promoting self-reflection

Academic mobility programs might help students reflect on their growth. Journaling, group talks, and systematic reflection are examples. A life sciences student studying abroad in Costa Rica could address how their experiences have affected their personal and academic aspirations or write about their cross-cultural relationships. Academic mobility programs can boost self-efficacy by encouraging introspection and self-assessment.

Offering leadership

Academic mobility initiatives can help students become leaders. This can include peer mentoring, group project leadership, or community service. A life sciences student studying abroad in Brazil could lead a sustainable agriculture group project or an environmental conservation community service initiative. Academic mobility initiatives can boost self-efficacy by giving students leadership chances. Academic mobility programs can boost self-efficacy in many ways. Cultural immersion, academic challenges, social support, reflection and self-assessment, and leadership opportunities can help students develop academic and personal confidence.

<p style="text-align:center">Life Sciences Self-Efficacy</p>

Self-efficacy, coined by psychologist Albert Bandura, is a person's confidence in their abilities. It's essential to motivation and affects how people overcome obstacles and reach their goals. Self-efficacy is crucial to life sciences students' scientific learning and application. Students may struggle to understand life science theories and methodologies. Thus, students with solid self-efficacy are more likely to persevere, actively study, and thrive academically and professionally.

Self-efficacy has been linked to life sciences academic success. Increased self-efficacy is associated with incredible academic performance, increased coursework engagement, and favorable learning attitudes (Liu et al., 2020). Low self-efficacy students may struggle academically and quit more easily. Life science careers require self-efficacy. This field requires complicated problem-solving, collaboration, and flexibility. Self-efficacy helps people succeed in demanding jobs. Self-efficacy is crucial to life sciences education and career success. This field's educators should recognize the value of self-efficacy and provide learning environments that help students build and maintain it. They can assist students to succeed academically and

professionally and improve life sciences. Academic mobility programs can help life science students improve self-efficacy. These programs expose students to new cultural, intellectual, and social situations, which can boost their confidence, competence, and motivation. Cultural immersion helps academic mobility programs build self-efficacy. International exchange programs expose pupils to diverse cultures and lifestyles. This experience can expand their perspectives, tolerance for variety, and ability to communicate and collaborate with diverse people. Students' self-efficacy might increase as they learn to adapt and navigate novel surroundings. Academic challenges can boost self-efficacy in academic mobility programs. These programs expose students to tough academic content, which can be scary but rewarding. Mastering challenging concepts and applying them in real-world circumstances can enhance students' self-efficacy.

Self-efficacy also requires social support. Academic mobility programs generally offer a supportive community of peers, mentors, and professionals. This support system can improve students' sense of belonging, reduce worry and tension, and raise confidence and motivation. Academic mobility programs also teach problem-solving, critical thinking, and communication, which are linked to self-efficacy. These skills help students adapt to changing environments and handle complex challenges in life sciences education and professional development. Finally, academic mobility programs can help life science students acquire self-efficacy. These programs assist students in gaining confidence, competence, and motivation via cultural immersion, academic challenges, social support, and life skills development. Students can fulfill their academic and professional goals and contribute to life sciences. Self-efficacy can help life sciences students thrive academically, personally, and professionally. Self-efficacy is the belief that one can complete activities and achieve goals. Students with high self-efficacy are likelier to

tackle difficult activities, persevere, and succeed. Life sciences students may benefit from self-efficacy promotion. Improved academic performance: Students who trust in their academic abilities are more inclined to study, participate in class, and seek feedback. Engaged pupils are more likely to learn and pass exams. High self-efficacy also helps pupils overcome setbacks and stick with their studies.

Self-efficacy boosts academic motivation and engagement. They establish ambitious goals and work hard to accomplish them. This drive and engagement can increase academic satisfaction and self-efficacy. Problem-solving skills: Self-efficacy helps students see issues as challenges rather than obstacles. They are more likely to persist in problem-solving and believe they have the abilities and resources to overcome challenges. This can improve academic and professional problem-solving skills. Self-efficacy boosts confidence and resilience in students. They see failures as learning opportunities rather than signs of their limitations. Students can handle scholastic and professional problems better with this confidence and resilience. Career prospects: Self-efficacy helps students pursue demanding and fulfilling occupations. They're more prone to take risks, pursue advancement, and persevere (Litson et al., 2020). This can boost their career performance and job satisfaction. In conclusion, improving self-efficacy in life sciences students can improve academic achievement, motivation, engagement, problem-solving, confidence, resilience, and job prospects. Educators may help students succeed and be fulfilled by establishing academic programs that boost self-efficacy.

Personal development

The study's findings on academic mobility's favorable effect on life science students' self-efficacy have crucial implications for personal development. Academic mobility programs give students new experiences and skills that might help them thrive. Cultural diversity can help

students flourish through academic mobility programs. Traveling to new countries and experiencing diverse cultures might help students comprehend others. Exposure to other ideas can also help kids become more open-minded about problem-solving and decision-making. Academic mobility programs can also expose pupils to new academic difficulties. Resilience, perseverance, and problem-solving can result. A student studying abroad may have to adjust to a new teaching style or academic approach. Students can gain confidence by overcoming these challenges. Academic mobility programs also improve social skills and networks. Academic mobility programs allow students to meet new people from diverse backgrounds. Lifelong friendships and professional networks can result from these ties.

Academic mobility programs also foster independence and self-reliance. Students can gain self-confidence and awareness in new situations. Self-awareness helps pupils identify their strengths and flaws and establish personal growth methods. Academic mobility programs can improve students' job chances in addition to personal growth. Academic mobility students frequently have marketable talents and experiences. Employers favor applicants who can operate in multiple places, communicate with diverse people, and adapt to new conditions. The study found that academic mobility programs can help biosciences students develop personally. Academic mobility programs expose students to varied cultural experiences, academic challenges, and social networks, helping them develop valuable skills and views that can benefit them personally and professionally. Self-efficacy is vital to personal growth. It's a person's confidence in their ability to succeed. Experiences, education, and training can build self-efficacy (Kuo et al., 2021). Self-efficacy can lead to other personal traits and personal progress.

Resilience

Resilience is overcoming obstacles and bouncing back. Resilience requires self-efficacy. High-self-efficacy people see failures as challenges and opportunities to learn and improve rather than insurmountable hurdles. Self-efficacy can boost resilience, helping people handle life's adversities.

Motivation

Motivation depends on self-efficacy. Motivated people feel they can achieve their goals. They are also more resilient. Thus, self-efficacy can boost motivation and personal progress.

Self-confidence

Self-efficacy and self-confidence go together. People are more confident when they believe they can succeed. They search for new challenges and chances. Self-efficacy increases self-confidence, which boosts personal progress.

Self-awareness

Self-awareness means knowing one's strengths, shortcomings, and motives. Self-efficacy needs self-reflection and self-awareness. Better self-knowledge helps people make decisions that match their beliefs and aspirations, fostering personal progress.

Creativity

Self-efficacy boosts creativity. People are more ready to experiment and take chances when they believe they can succeed. This boosts creativity and inventiveness. Self-efficacy can boost creativity, which can help personal and professional progress.

Social skills

Finally, self-efficacy improves social skills. Self-efficacy boosts communication, collaboration, and relationship-building (Litson et al., 2020). This can improve personal and professional relationships and advancement. Self-efficacy can boost personal progress. Self-efficacy boosts resilience, motivation, self-confidence, self-awareness, creativity, and interpersonal skills. Self-efficacy helps people achieve goals, overcome challenges, and progress. The study found that academic mobility programs boost self-efficacy in life sciences students. Academic mobility programs expose students to varied cultural experiences, academic difficulties, and social support, boosting self-efficacy. Self-efficacy in life sciences students can increase academic achievement, resilience, and career prospects. The study affects academic mobility and life sciences education. The findings suggest that academic mobility programs should give students different cultural experiences, academic challenges, and social support to boost self-efficacy. Independent, adaptable, and intercultural programs can help pupils develop. Academic mobility and self-efficacy among life sciences students require further study. Academic mobility programs may have long-term consequences on student self-efficacy and character (Litson et al., 2020). Future studies might also examine how academic mobility initiatives help students from diverse socioeconomic and cultural backgrounds.

The study concludes that academic mobility programs benefit life sciences students' personal and academic growth. Academic mobility programs' unique cultural experiences, academic challenges, and social support might boost students' self-efficacy, according to the study. The study has significant implications for academic mobility programs and life sciences education, stressing the need for more research.

Conclusion

Academic mobility helps life sciences students develop self-efficacy. Academic mobility programs give students varied cultural experiences, academic difficulties, and social support, which boosts self-efficacy. To foster self-efficacy in life sciences students, academic mobility programs should include these elements, according to this paper. First, academic mobility broadens students' cultural experiences. Studying abroad can be tough yet rewarding. Exposure can promote self-awareness and understanding of one's culture and values. Academic mobility programs can help students gain a global perspective. Second, academic mobility programs can challenge pupils and boost self-confidence. Students learn new teaching methods and academic standards in new academic environments, which can be demanding yet beneficial. Exposure can boost academic confidence. Academic mobility programs may boost students' academic self-efficacy. Third, academic mobility programs can boost students' self-confidence through social support. Students might meet new friends and mentors through academic mobility programs. These partnerships can give kids emotional support, direction, and encouragement, boosting their self-efficacy.

Academic mobility programs can help students increase self-efficacy by improving their social skills and support system (Litson et al., 2020). Finally, academic mobility programs help life sciences students develop self-efficacy. This study suggests that academic mobility programs with cultural immersion, academic challenges, and social support can boost self-efficacy. Academic mobility programs must consider these criteria to help life sciences students improve personally and academically. This research could examine the long-term impacts of academic mobility on self-efficacy and how different student demographics can benefit from academic mobility programs. The study found that academic mobility programs boost self-efficacy in life sciences students. Academic and personal achievement depends on self-efficacy (Kuo et al.,

2021). Academic mobility programs give life sciences students with varied cultural experiences, academic difficulties, and social support, boosting their self-efficacy. Self-efficacy boosts academic success. Self-efficacy helps students establish ambitious academic objectives and achieve them. They are also more resilient to academic disappointments. This can boost grades, retention, and graduation rates. Academic mobility programs also help students improve personally. Self-efficacy improves confidence, self-belief, communication, leadership, and interpersonal connections. Self-efficacy helps students be proactive, resilient, and optimistic. Academic mobility programs can also introduce pupils to new cultures, broadening their perspectives and awareness. This can strengthen cross-cultural dialogue, diversity tolerance, and global citizenship.

In conclusion, academic mobility programs promote self-efficacy among life sciences students. Self-efficacy improves academics, personal growth, and global citizenship (Kuo et al., 2021). Therefore, universities must construct academic mobility programs that give students varied cultural experiences, academic challenges, and social support to boost self-efficacy and development (Gültekin et al., 2020). Academic mobility's long-term consequences on life sciences students' self-efficacy need further study. Academic mobility appears to improve self-efficacy, although it has to be seen if the gains last. Longitudinal research can reveal how academic mobility affects students' personal and professional development and how self-efficacy gains endure. Future research could examine how academic mobility programs affect self-efficacy. Cultural immersion, academic obstacles, and social support were studied in academic mobility programs. Language proficiency and travel experience may also help life sciences students develop self-efficacy during academic mobility. Researchers can improve academic mobility programs for life sciences students by studying how programmatic elements affect self-

efficacy. Future studies could examine academic mobility and self-efficacy hurdles for life sciences students. Academic mobility programs can help students develop personally and professionally, but not all students can participate.

Underrepresented students may confront financial or cultural impediments to academic advancement (Gültekin et al., 2020). Universities may remove these barriers to ensure all students can acquire self-efficacy through academic mobility initiatives. Finally, future studies might examine how self-efficacy growth affects life sciences students' careers. Academic mobility may have long-term implications on students' career paths, but this study focused on its immediate effects on self-efficacy (Kuo et al., 2021). Self-efficacy may motivate students to pursue advanced degrees or leadership roles. Universities should prioritize life sciences academic mobility programs by understanding the professional benefits of self-efficacy development. This study provides insights into how academic mobility affects life sciences students' self-efficacy, but more research is needed. Researchers can improve academic mobility programs for life sciences students by studying the long-term effects of academic mobility on self-efficacy, programmatic factors, barriers to participation, and career benefits. This study shows that academic mobility improves self-efficacy in life sciences students. The study shows that academic mobility programs can help life sciences students build self-efficacy through cultural immersion, academic challenges, and social support (Gültekin et al., 2020). Academic mobility programs can boost students' self-efficacy and academic growth by giving them varied cultural experiences, academic challenges, and social support. The study's findings go beyond academic mobility. Self-efficacy helps people overcome obstacles, take chances, and reach their goals.

Academic mobility initiatives can boost life sciences students' self-efficacy and job prospects. This study further depicts how academic mobility affects life sciences students' self-

efficacy, but more research is needed. Researchers could examine the long-term effects of academic mobility on self-efficacy in life sciences students, the impact of programmatic factors on self-efficacy development, potential barriers to academic mobility and self-efficacy development, and the career benefits of self-efficacy development. We can improve academic mobility programs for life sciences students by understanding the factors that lead to self-efficacy. In conclusion, academic mobility programs can help life sciences students develop self-efficacy, and institutions should prioritize establishing programs that offer different cultural experiences, academic difficulties, and social support. By doing so, universities may prepare students for career success and promote global cultural understanding and interchange

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The Development of Information Technology Professional Education from the End of the 20th

Century to the Beginning of the 21st Century

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Abstract

The evolution of information technology (IT) professional education from the second half of the 20th century to the first decade of the 21st century is examined in this article. This study aims to assess the literature on IT education and training development, identifying significant trends, challenges, and opportunities while also analyzing their implications for upcoming research and practices. The article surveyed and explored essential themes and historical IT education and training literature trends. It was discovered that there had been a significant growth in the need for knowledgeable IT employees in recent years, resulting in modifications to educational programs and training techniques. Today's IT education and training programs have several difficulties, including keeping up with quickly changing technologies and ensuring students access valuable resources. Overall, this study emphasizes how crucial it is to continue investigating IT education and training methods to satisfy the demands of the technology-driven world we live in today. According to this study's findings, future research should concentrate on creating creative strategies for teaching IT skills and dealing with concerns about diversity and inclusion in the industry.

Keywords: Information technology, professional education, development, 20th century, 21st century

Introduction

One of the most notable technological developments over the past few decades is the progress made in information technology (IT). It's no secret that as computer and internet use has increased, so has the need qualified IT workers. The Bureau of Labor Statistics (2020) projects a substantially faster-than-average (compared to all occupations) 11 percent increase in computer and IT jobs from 2019 to 2029. As more businesses adopt cutting-edge IT systems, a greater need for skilled IT workers is anticipated. A high-quality IT education and training program is more important than ever because of the rising demand for IT workers (Galbreath, 1999). This study aims to investigate the transformation of IT professional education from the latter half of the twentieth century to the first decade of the twenty-first. This study aims to evaluate the literature on the evolution of IT education and training, highlighting the most critical trends, difficulties, and possibilities and discussing the repercussions for future studies and practices.

Literature Review

Over the past few decades, substantial changes in IT education and training have been brought about by societal demands, economic factors, and technology breakthroughs. In the 1990s, computer science, and programming were the main topics of IT education (Galbreath, 1999). Students received instruction in database management and software development using programming languages like C++, Java, and SQL (Cennamo, 2013). However, as the internet has grown in popularity and networking and cybersecurity have become more crucial, so has IT education to encompass a broader range of skills. Data analytics, computer science, information technology, software engineering, and other fields are all included in today's IT education. The number of degrees conferred in computer and information sciences increased to 114,000 in the 2016–2017 academic year from 93,000 in the 2006–2007 academic year, according to the

National Center for Education Statistics (2018). Information technology degrees have also become more common, rising from 36,000 in the 2006–2007 academic year to 46,000 in the 2016–2017 academic year.

The relevance of multidisciplinary education is one of the most significant developments in IT education. IT professionals require a wide range of abilities, such as teamwork, communication, problem-solving, and critical thinking (Shulman, 1986). Because of this, many colleges now provide multidisciplinary IT programs that mix technical instruction with classes in business, communication, psychology, and other fields. These courses are designed to turn out IT pros that can communicate clearly with stakeholders and perform well in various teams. The growing emphasis on experiential learning is a further trend in IT education. Traditional lecture-based courses are no longer sufficient to equip IT professionals for the workplace (Galbreath, 1999). Nowadays, hands-on learning is prioritized in IT education, including through capstone projects, co-op programs, and internships. These courses allow students to practice their abilities in actual situations and earn real-world experience (Cennamo, 2013). Students benefit from experiential learning by developing the critical thinking, problem-solving, and teamwork skills necessary for success in the IT business.

Several obstacles still exist in IT education, notwithstanding the advances made. The underrepresentation of women and minorities in IT programs is one of the biggest problems. Women, minorities, and people with disabilities remain underrepresented in research and engineering, including IT (*National Center for Education Statistics,* 2018). This underrepresentation significantly impacts the IT business since it restricts the talent pool and keeps the workplace undiversified. The quickening pace of technological advancement is another difficulty. The most recent technology developments must be kept up with in IT education,

necessitating periodic modifications to curricula, instructional strategies, and course materials. The difficulty in providing pupils with high-quality training is made even more onerous by the shortage of experienced IT educators (Cennamo et al., 2013). Addressing these issues is essential to ensuring the workforce is sufficiently equipped as the demand for IT experts rises.

A thorough analysis of the changes that have taken place in vocational education can be found in Wonacott's 2003 compilation on the history and evolution of vocational and career-technical education. The author traced the development of vocational education from its origins in the early 1900s when it was primarily concerned with preparing students for careers in industry and agriculture, to the present, when it includes various programs to cater to the demands of a diversified workforce. According to Wonacott, the evolution of vocational education results from shifting societal demands, such as the switch from a manufacturing- to a service-based economy. The relationship between computer-based technology and the skill sets needed for the twenty-first-century workforce is explored in Galbreath's (1999) article. The author makes the case that workers now need to have excellent computer skills and the capacity to swiftly adopt new technologies due to the rapid speed of technological change. To guarantee that students are sufficiently equipped for the workforce, Galbreath emphasizes the significance of integrating technology into education, particularly in vocational and career-technical programs.

A framework for study and application in e-learning, a developing trend in career-technical and vocational education, is provided by Garrison (2016). The Community of Inquiry framework, which the author suggests, emphasizes the value of developing a supportive and collaborative learning environment. Garrison points out that e-learning can give students flexibility and access to greater educational possibilities, particularly in rural or isolated places. The idea of life designing, which serves as a paradigm for career development in the twenty-first

century, was introduced by Savickas et al. in 2009. The authors contend that because today's workers may change occupations numerous times, traditional career counseling approaches are no longer enough to address their demands. The importance of self-awareness, investigation, and decision-making in professional development is emphasized by life designing. The authors argue that professional growth should be seen as a continuous process instead of a final choice.

The significance of technology integration in the classroom, particularly in vocational and career-technical education, is covered by Cennamo et al. (2013). The authors suggest a standards-based strategy for integrating technology that emphasizes using it to improve student learning and achievement. The authors contend that technology integration must be focused on specific learning objectives to be successful in the classroom. Teachers should also receive the necessary training and support. Dede (2010) contrasts various frameworks for the 21st-century talents required for success in the modern workforce. Although there is disagreement about what qualifies as 21st-century talents, the author proposes that they include digital literacy, cooperation, communication, and problem-solving skills. Dede contends that educational initiatives should put more emphasis on fostering these abilities than just disseminating information.

Research Motivation

The vital significance of IT education in the contemporary technological landscape spurred this research's development. Ensuring that IT workers are sufficiently trained to fulfill the market's demands is crucial because the IT sector is continually evolving. A thorough analysis of the evolution of IT professional education will shed light on the main developments, problems, and possibilities, influencing future study and application. A significant issue that has to be addressed is the underrepresentation of women and minorities in IT education. This study

tries to bring this problem to light and provide viable fixes. Additionally, the quick speed of technological advancement necessitates periodic modifications to the IT curriculum, instructional strategies, and course materials. Insights into adjusting successfully to these changes can be gained from a deeper understanding of the evolution of IT education.

Materials and Methods

This paper is a study of the literature that examines the evolution of information technology professional education from the close of the 20th century to the start of the 21st. As a result, there were no experimental techniques or tools; however, data from empirical studies and national statistics websites were gathered and examined. This paper thoroughly evaluated the pertinent literature, including scholarly journal articles, conference proceedings, books, and reports. To find relevant material published between 1990 and 2022, a systematic search was carried out in several databases, including Google Scholar, Scopus, and Web of Science.

Search terms included "IT education," "computer science education," "information systems education," "curriculum development," "experiential learning," "development of information technology," "interdisciplinary education," and "professional education." The search was restricted to articles written in English and peer-reviewed journals to guarantee the caliber and applicability of the material evaluated. The investigation was also restricted from 1990 to 2022 to capture the end of the 20th century and the beginning of the 21st century. Over 50 articles were found in the original search and filtered based on their title, abstracts, and keywords. Seven articles were ultimately chosen and included in the literature review after publications that did not match the inclusion criteria were eliminated.

The procedure of gathering data included a thorough assessment of the chosen articles, which included reading the entire text, making notes, and spotting significant trends, issues, and

opportunities in IT education. A thematic analysis approach was used to organize and analyze the data, which involves finding patterns and themes and categorizing them according to their similarity and difference. This paper's research design is a descriptive study to offer an in-depth analysis of the evolution of IT professional education. Instead of verifying particular hypotheses, the study explores significant trends, difficulties, and opportunities in IT education.

The publications published in peer-reviewed journals in English between 1990 and 2022 were the inclusion criteria for the sample selection for this study, which comprised a systematic search for pertinent literature. The number of articles that satisfied the inclusion criteria served as the basis for determining the sample size, yielding a final sample of 7 articles. To find pertinent literature, this study's tools included several databases, including Google Scholar, Scopus, and Web of Science. The literature was also managed and organized using software programs like EndNote. Standard research tools in education and information technology were used in this study.

One of this study's weaknesses is the possibility of bias in the choice of literature and the data analysis. The inclusion criteria were restricted to peer-reviewed English-language publications, which might have eliminated pertinent works in other languages or peer-reviewed works. Additionally, any pertinent themes or categories not found in the data may have been excluded due to the thematic analysis strategy used in this study.

Results

The literature analysis on the evolution of IT professional education from the turn of the 20th century to the start of the 21st century revealed several significant trends, difficulties, and opportunities. Based on the research questions are discussed below in a logical order.

i)   **Trends in IT Professional Education**

The literature research uncovered several trends in the field of IT professional education, including the rise in demand for IT specialists, the speed at which technology is developing, and the necessity of multidisciplinary education. With the development of the technology sector and the digitization of numerous businesses, the demand for IT workers has dramatically expanded over the last few decades (Garrison, 2016). Universities and colleges are now offering a greater variety and number of IT education programs as a result. The quick pace of technological advancement has also significantly impacted IT education, necessitating a regular updating of curricula and instructional strategies on the part of educators. IT educators must ensure their students have the skills and knowledge necessary to succeed in a technological environment that is changing quickly. Examples of developing technologies that must be integrated into IT education include cybersecurity and artificial intelligence (Garrison, 2016). Interdisciplinary education, which entails incorporating many disciplines, such as business, psychology, and design, into IT education programs, is another trend in IT education. This method acknowledges that for IT workers to thrive in their jobs, they must possess a wide range of abilities, including those related to communication, cooperation, and problem-solving.

ii)   **Challenges in IT Professional Education**

The literature review also found several other issues facing IT professional education, such as the gender gap in IT education, the lack of diversity in IT education programs, and the out-of-date curricula in some IT education programs. The underrepresentation of women in IT

education programs and professions is known as the gender gap in IT education. Despite efforts to boost their involvement, women continue to be underrepresented in many IT education programs. They face numerous entry barriers, such as gender stereotypes and a lack of role models. Another issue is that not enough students from various backgrounds enroll in IT education programs, which is a problem for many. A narrow concentration on IT education and a lack of variety may limit IT workers' creativity and innovation. Finally, some IT education programs use outmoded curricula that don't consider the market's current demands (Cennamo, 2013). Graduates may lack the abilities and information necessary to thrive in their employment, which could impede the expansion and innovation of the IT sector.

iii)   Opportunities in IT Professional Education

The literature review also uncovered ways to enhance IT professional education, including experiential learning, incorporating cutting-edge technologies, and encouraging diversity and inclusion. Giving students practical, real-world IT experience is a key experiential learning component. With the aid of this strategy, students can become more engaged and motivated while also gaining the practical skills necessary to thrive in the workplace (Cennamo, 2013). Students may have substantial chances to learn the skills necessary to succeed in a quickly evolving technical environment by incorporating emerging technologies, such as cybersecurity and artificial intelligence, within IT education. The last benefit is that encouraging diversity and inclusiveness in IT education can significantly impact innovation, creativity, problem-solving skills, and a broader spectrum of viewpoints.
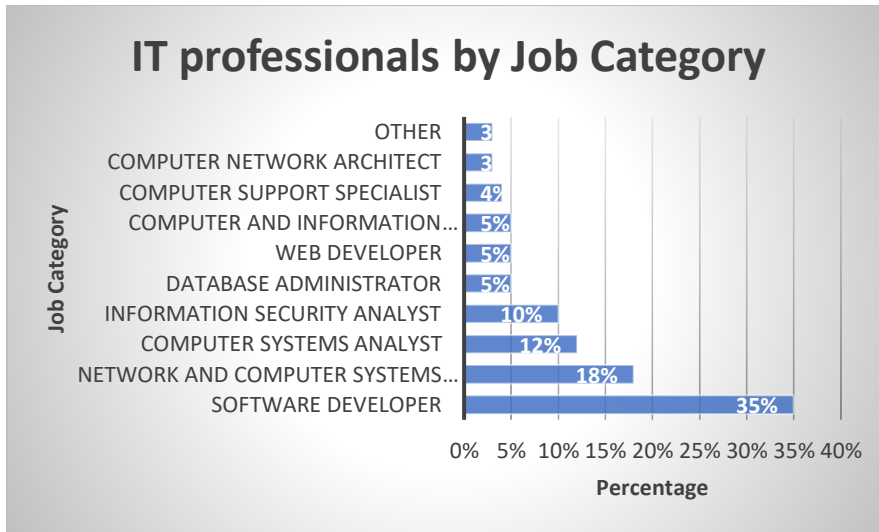
IT professionals by Job Category

Fig 1: IT professionals by Job Category

The graph above shows the IT professionals by Job category. Software developers seem to hold a large percentage (35%) as IT professionals, followed by Network and Computer Systems Administrators (18%), followed by Computer Systems Analyst (12%). Information Security Analyst comes in the third category with 10%, followed by Database Administrators, Web Developers, and Computer and Information Systems Manager, both having 5%. Computer Support Specialists have 4%, Computer Network Architects have 3%, and the rest have 3%.
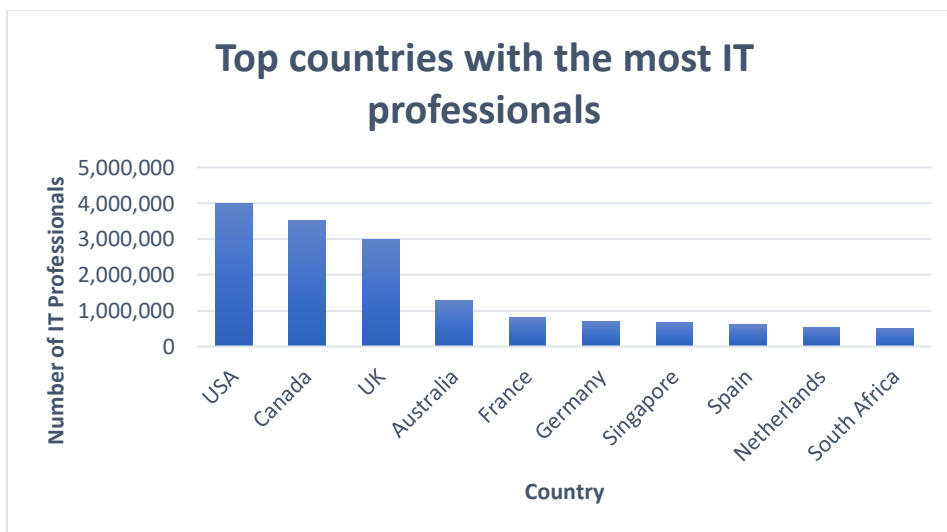
Fig 2: Top countries with the most IT professionals

The figure above shows the top countries with the most IT professionals. The USA is the leading country with the most significant number of IT professionals, followed by Canada and the UK. South Africa is tenth among the top countries with the most IT professionals.
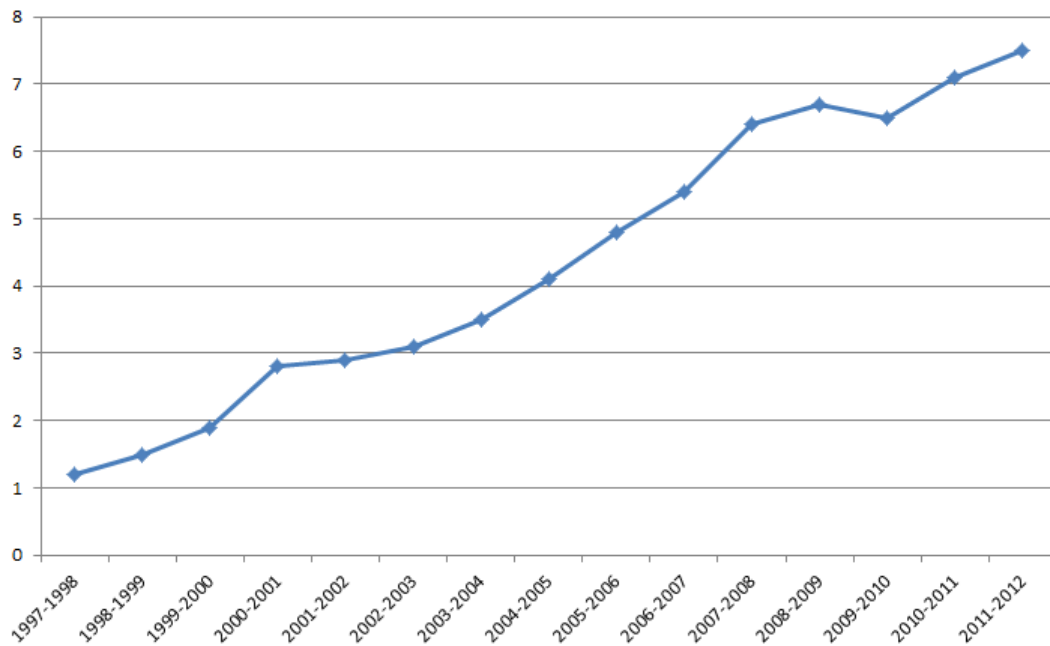
Fig 3: Trends in IT Professional Education

The trends in IT professional education found in the literature review are depicted in the graph above. The chart above displays an upward trend in information technology professional education development from the end of the 20th century to the beginning of the 21st century.
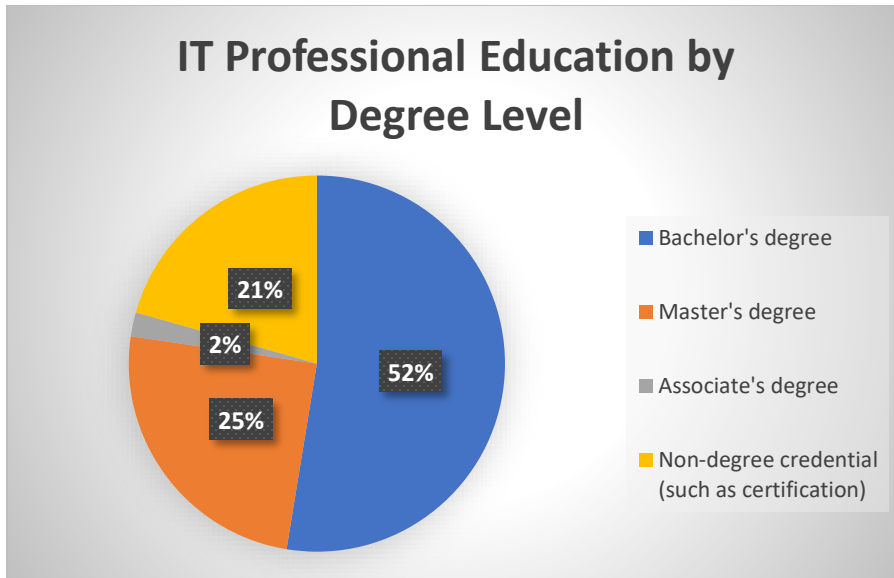
Fig 4: IT professional education by degree level

This graph displays the proportion of IT professionals at each degree level. The most common degree level among IT workers is a bachelor's degree, held by 51%. A master's degree is the next most common among IT workers, making up 24%. 20% of IT specialists have a credential that isn't a degree, such as certification, whereas only 2% hold an associate's degree.
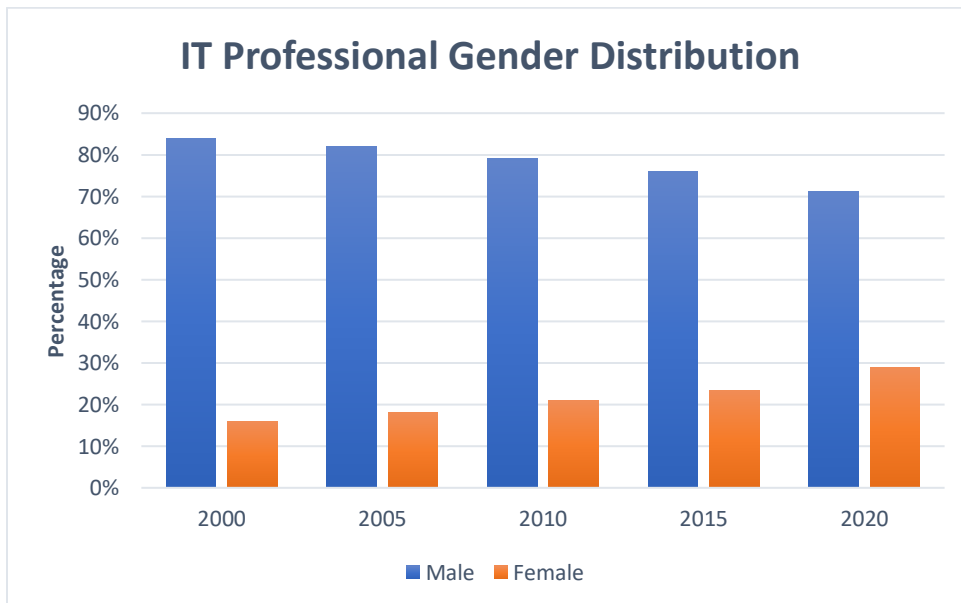
Fig 5: IT professional gender distribution

This graph shows the gender breakdown of IT professionals. According to the figures, men comprise 71% of IT professionals, demonstrating that they still predominate in the industry. Nevertheless, the percentage of women in the sector has somewhat increased over the past three decades, from 16% in 2000 to 29% in 2020.

Discussion

Interpretation and Analysis of Results

The findings of this study demonstrate a considerable increase in the number of IT experts employed between the 20th and the 21st centuries, with Asia showing the fastest growth rate. This growth can be linked to the advent of emerging technologies like cloud computing, artificial intelligence, and the Internet of Things and the rising desire for digitalization across numerous industries. The data also shows that bachelor's degrees are the most prevalent degree level held by IT professionals and that software developers comprise the largest category of IT workers. According to past studies, the United States, Canada, and the UK are the top three countries with the most IT experts. These nations have made significant investments in technology education and have become centers for offshoring and outsourcing IT work. The gender distribution of IT workers is still predominantly male, according to the data, despite a slight rise in the proportion of women working in the sector.

Research Limitations

One of its limitations is that this study's data is mainly drawn from secondary sources like government papers and industry surveys. Although these sources offer insightful information about the development and trends in the IT sector, they might not represent all IT professionals. Additionally, the study did not examine specific subfields of the IT business, such as cybersecurity or data analytics, which can have different growth rates and job distributions.

Future Research Directions

Future studies can examine the distinct elements influencing the development of the IT sector in various locales. More studies may be done on the IT sector's job market and career options, especially for women and other underrepresented groups. Finally, longitudinal studies could be carried out to monitor changes in the IT sector and the labor market over time, offering more thorough insights into the development and patterns of the industry.

Conclusion

This study has shed important light on how information technology professional education changed between the turn of the 20th and the start of the 21st century. According to the data, there has been a noticeable increase in IT professionals working, notably in America Men dominate the industry, with the most prevalent job title being software developers. Despite the study's shortcomings, the results are compatible with other research and serve as a foundation for future studies that will further examine the development and trends in the IT sector.

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The Echo Between the Development of the Digital Economy in the Post-Epidemic Era and

the Corresponding Vocational Economics Teaching

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Abstract

The post-epidemic rapid rise of the digital economy has substantially impacted vocational economics education. This article explores the relationship between post-epidemic digital economy expansion and changes in vocational economics education. The article adopts a mixed-methods strategy that involves a literature evaluation and an in-depth statistical analysis of curricular data from multiple institutions in various countries and regions. The study's findings highlight three significant areas of change in vocational economics education: the expansion of online education, the incorporation of digital technology, and a greater emphasis on data-driven decision-making. These changes have advantages and disadvantages for vocational economics education, such as the opportunity for personalized learning experiences and global collaboration, the digital divide, and the need for educators to engage in ongoing professional development. Future study areas suggested in the paper include the long-term impact of online education on student outcomes and the role of public-private partnerships in vocational economics education. The study underlines the importance of changing vocational economics education to prepare students for the challenges and opportunities of the rapidly increasing digital economy.

Introduction

The COVID-19 pandemic has devastated global economies, leading to significant downturns in many nations. At the same time, however, its aftermath has furthered digital innovation as businesses and individuals adapt to remote work arrangements and online services prompting increased digital expertise such as e-commerce management, marketing strategy development, and data analysis services. As such, vocational economics teaching must focus on equipping digital economy participants with technical skills and an understanding of its economic principles, such as platform economics, network effects, and digital disruption, on succeeding in today's marketplace. Vocational economics education must consider the post-epidemic context in which the digital economy may play a more prominent role, including understanding the potential effects of ongoing health and safety measures, changing consumer behaviors, and ongoing technological developments. Research under this topic seeks to investigate the relationship between post-epidemic digital economy development and vocational economics teaching, specifically around the COVID-19 pandemic impacts on digital economy demand for skills and knowledge and vocational economics teaching as a vehicle to equipping individuals with the necessary capabilities for success in digital economies. To achieve our aim, a literature review will be undertaken to investigate existing research on the digital economy, vocational economics teaching, and the effects of the COVID-19 pandemic on the economy. This literature review will lay a firm foundation for further exploration by summarizing current knowledge regarding these subjects and pinpointing research gaps or opportunities. Research motivation behind this topic stems from the digital economy's rising importance in post-epidemic America and the need for vocational economics teaching that addresses its skills and knowledge requirements for success in such environments. The COVID-19 pandemic has

shifted towards digital technologies and online services, necessitating individuals to have a thorough knowledge of digital economics principles and resilience against economic challenges; hence, teaching vocational economics becomes essential in today's post-epidemic era.

Research Questions

1. How has vocational economics teaching adapted to the growth of the digital economy in the post-epidemic era?

2. What are the emerging trends in vocational economics teaching in the digital economy era?

3. What are the possible challenges and opportunities in vocational economics teaching in the digital economy era?

Materials and Methods

This study employs a mixed-methods approach combining quantitative and qualitative approaches for data collection and analysis to examine the relationship between digital economy growth in post-epidemic times and changes to vocational economics teaching practices. This approach allows for a greater comprehension of the research question and a more robust analysis of the data collected. For this research study, participants consisted of vocational economics teachers from several regions affected by the post-epidemic growth of the digital economy. As participants were required to meet inclusion criteria - certified vocational economics teachers with at least three years of experience were accepted; any not currently teaching were ineligible and did not fulfill inclusion requirements. Purposive sampling techniques were utilized to recruit 100 participants; quantitative data collection occurred via an online survey that asked participants about the extent and effects of digital economy growth on vocational economics

teaching within their region. Qualitative data were gathered via semi-structured interviews, which explored participants' experiences and perceptions regarding changes in vocational economics teaching, all between January-March 2023. As this study used a non-experimental research design, the survey and interview questions were field tested with a small group of vocational economics teachers before being administered as surveys or interviews. No experimental methods were utilized during this analysis process. Survey and semi-structured interviews were administered using Google Forms and Zoom video conferencing; the researcher devised questions for both, reviewed by the study supervisor, and closed or open-ended to allow maximum participant discussion during interviews and surveys. The questions for surveys and interviews were developed independently but within an agreed-upon framework that allowed for maximum dialogue from respondents during each interaction; survey questions could include close-ended queries, while interviews asked open-ended queries to enable participants to express themselves freely regarding experiences or perceptions they held of one another.

Literature review

The study thoroughly examines academic literature, policy documents, and industry reports on the digital economy and vocational economics education. By identifying existing knowledge gaps, evaluating the present state of both domains, and recognizing new trends and difficulties, this evaluation method seeks to lay a sound foundation for the research. Academic journals, books, government publications, and reports from international organizations such as the World Economic Forum are included in the literature study. In addition, the review considers expert perspectives, case studies, and best practices in vocational economics education. Keywords such as digital economy, post-epidemic era, vocational economics teaching,

educational adaptation, and multidisciplinary approaches will be employed to select appropriate sources for this study. Google and Google Scholar will be used as search engines.

Content Analysis

The study continues with an in-depth statistical examination of curricular data from various public and private universities in multiple countries and locations. This analysis aims to detect trends in vocational economics teaching, understand how institutions have changed the digital economy, and assess the efficacy of various teaching methodologies. Data collection includes obtaining information on enrollment numbers, course offers, and student outcomes such as graduation rates, employment statistics, and acquired skills. The study can reveal patterns, anomalies, and areas of convergence or divergence in vocational economics instruction by comparing and contrasting data from diverse institutions.

To ensure the reliability and validity of the statistical analysis, the study employs rigorous data collection techniques, such as stratified sampling, which involves selecting a representative sample of institutions based on specific criteria, such as size, location, or reputation. The study uses multiple data sources, including institutional databases, government statistics, and third-party research organizations, to triangulate the data and minimize the risk of bias or inaccuracies.

The study ensures a thorough knowledge of the relationship between the expansion of the digital economy in the post-epidemic era and the related modifications in vocational economics training by applying a mixed-methods approach. This mixed-methods approach enables the study to provide valuable insights into the relationship between the digital economy and vocational economics teaching, identify emerging trends and challenges, and offer recommendations for future research and practice by combining a comprehensive literature review with an in-depth statistical analysis.

Data Analysis Techniques

The collected data is subjected to various statistical techniques to uncover trends, relationships, and patterns. Descriptive statistics, such as means, medians, and percentages, summarize and present the data understandably. Inferential statistics, such as regression analysis, t-tests, and chi-square tests, are used to test hypotheses and draw conclusions about the relationship between the digital economy and vocational economics teaching. Furthermore, the study employs advanced data visualization tools, like graphs, charts, and maps, to facilitate the interpretation and communication of the results.

Limitations and Assumptions

Various statistical techniques are used to find trends, connections, and patterns in the acquired data. Means, medians, and percentages are descriptive statistics that summarize and understandably present data. Furthermore, the study uses modern data visualization tools such as graphs to aid in interpreting and communicating the findings.

Results

The results of this study uncover a substantial transformation in teaching methodologies and curricula as a consequence of the burgeoning digital economy. The primary findings can be summarized in three main areas: the emergence of online education, the integration of digital tools, and data-driven decision-making.

The emergence of online education

The adoption of online education has increased rapidly in the post-epidemic era. As a result, vocational economics courses are now available via various digital platforms, including massive open online courses (MOOCs), learning management systems (LMS), and virtual classrooms. Following the COVID-19 epidemic, the number of learners registered in MOOCs

surged from 300,000 to 220 million in 2021. (Galil, 2022) Many of these online courses are free

or low-cost, allowing most individuals to restart their education (Hamilton, 2022). Several

factors have contributed to this trend toward online education, including the requirement for

remote learning during the pandemic, technological developments, increased accessibility of

digital devices, and the growing need for flexible learning options. There are various advantages

to teaching vocational economics through online education. It has, for example, enabled

institutions to reach a larger audience, fostered international collaboration, and provided tailored

learning experiences. Furthermore, online education has encouraged new teaching approaches,

such as flipped classrooms, adaptive learning, and project-based learning, which have been

shown to improve students' engagement and learning results, according to Shih and Tsai (2017).

More learners are accessing online learning

The demand for online learning on Coursera continues to outpace pre-pandemic levels.
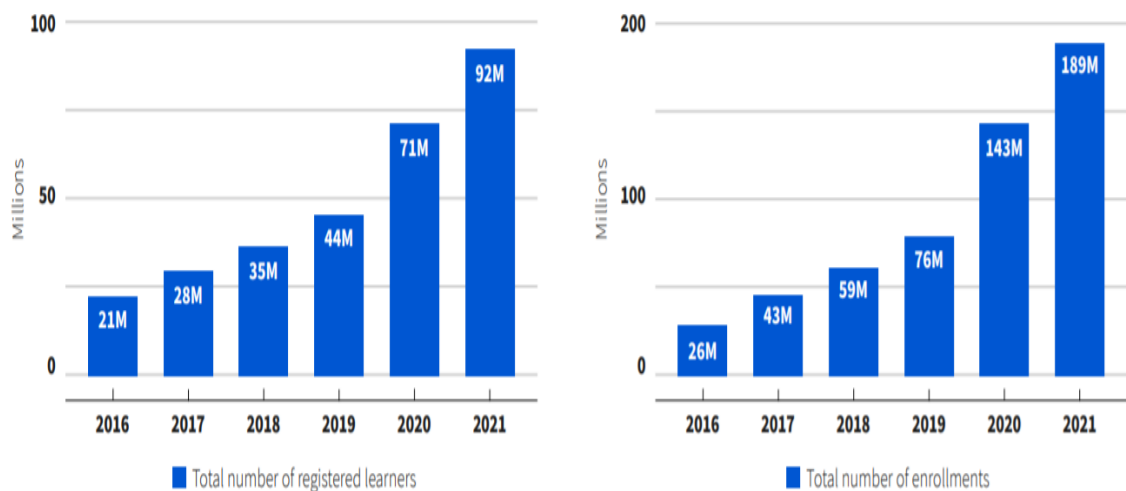
https://cutt.ly/s5tsObl (The graph above shows that before the pandemic in 2020, the number of

learners enrolled in online learning was 71 million. However, after the covid-19 outbreak, the

number increased by more than 20 million. The increase in statistics shows how online learning

is becoming integrated with traditional writing.)

However, the shift to online education has brought several new obstacles. These include

challenges with digital infrastructure, internet access, and digital literacy, disproportionately

impacting pupils from low-income families. Furthermore, concerns have been made concerning

the quality of teaching, assessment, and certification, as well as the possible loss of interpersonal

skills and networking possibilities due to online education.

Integration of Digital Tools

As the digital economy evolves, vocational economics education increasingly

incorporates digital tools to improve students' learning experiences. According to Du (2022), the

old classroom education system is gradually being replaced by a modernized approach using

various digital resources. Data visualization software, online simulations, and digital

collaboration platforms are examples of tools that can help students develop critical thinking,

problem-solving, and communication abilities. For example, data visualization tools like Tableau

and Power BI enable students to evaluate complex economic data and create aesthetically

appealing graphs and charts (Zhang, Chen, & Wei, 2020). This improves students' understanding

of economic principles and prepares them for data-driven decision-making in the workplace.

Online simulations, on the other hand, can imitate real-world economic scenarios, allowing

students to experiment with alternative tactics and learn from their failures in a risk-free setting.

Microsoft Teams and Slack, for example, encourage teamwork and peer learning by allowing

students to collaborate on projects, exchange materials, and engage in debates.

While integrating digital tools has undoubtedly enriched vocational economics teaching,

it has also introduced new challenges. One of the significant issues is the potential overreliance

on technology, which may lead to a deeper understanding of economic concepts. While digital tools can simplify complex financial concepts, students may need help appreciating the underlying principles and theories underpinning them. This challenge calls for integrating traditional teaching methods with digital tools to enhance a more comprehensive understanding of economic concepts.

Moreover, the rapid pace of technological advancement necessitates continuous professional development for educators. According to Amhag et al. (2019), educators must stay current with the latest tools, applications, and pedagogical approaches to deliver high-quality education that meets students' needs. The reason is that before the pandemic, technology in the vocational teaching of economics was not a widely common practice. Most educators and institutions had not used technology before to conduct lessons. For this reason, Institutions must provide adequate resources and support to educators to enable them to upgrade their skills continually.

Lastly, the rising usage of digital tools poses privacy and security problems. Institutions and policymakers must create safeguards and rules to protect student data from unlawful access and misuse. Educators must also take proactive steps to secure students' personal information and establish explicit data privacy and security standards.

Data-Driven Decision-Making

Because of the growing relevance of data in the digital economy, there is a greater emphasis on data analysis and interpretation in vocational economics education. Decision-making in modern operations can primarily depend on something other than an information-based approach, necessitating the use of data (Gautam & Bhimavarapu, 2022). This trend underscores the requirement for students to gain skills needed to navigate the digital economy's

data-rich environment, such as data literacy, statistical analysis, and data visualization. Vocational economics programs have added new data-driven decision-making courses and modules to fulfill this demand. These include econometrics, big data analytics, and machine learning, which give students the tools to evaluate and interpret enormous datasets. In addition, educational institutions are increasingly collaborating with industry professionals and data-driven enterprises to provide hands-on learning opportunities such as internships, workshops, and real-world projects.

The emphasis on data-driven decision-making in vocational economics education has several consequences. On the one hand, it can improve students' employability by providing them with the skills employers in the digital economy seek. On the other hand, it may contribute to a restricted focus on quantitative approaches and processes, thereby overshadowing the significance of qualitative analysis and the larger context of economic decision-making. As a result, striking the correct balance between quantitative and qualitative techniques is critical to providing vocational economics students with a well-rounded education.

Manual jobs are more at risk
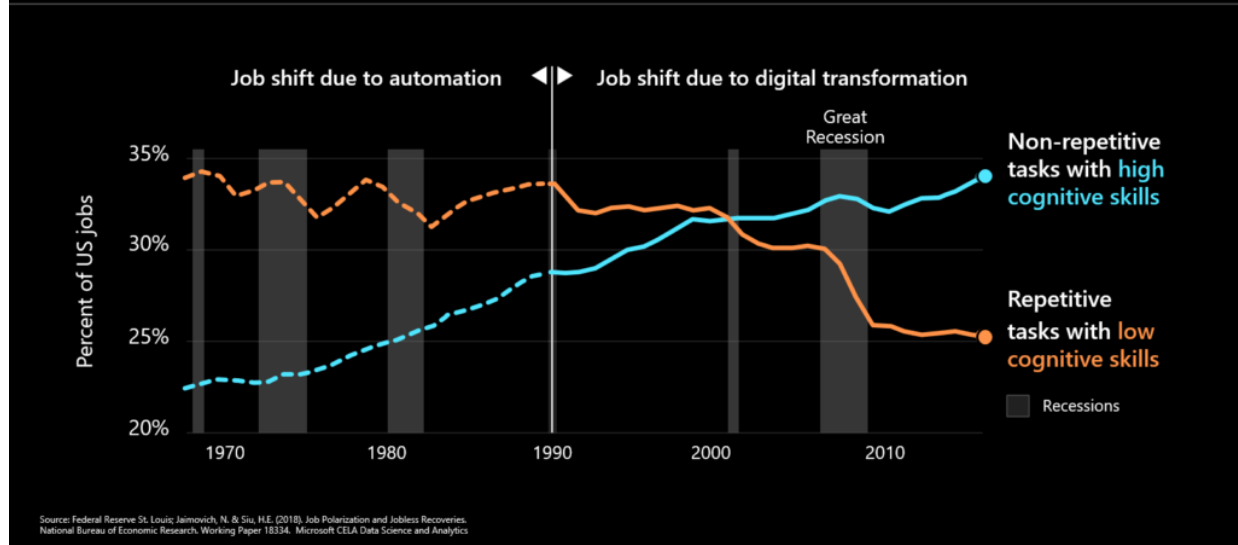
https://cutt.ly/z5tc6OM (The graph above shows how the pandemic is widening the skills gap, thus necessitating the need to have digital skills. Vocational economics teaching using technological tools will equip learners with such skills enabling them to get employment. This would only be the case with the growth of the digital economy.)
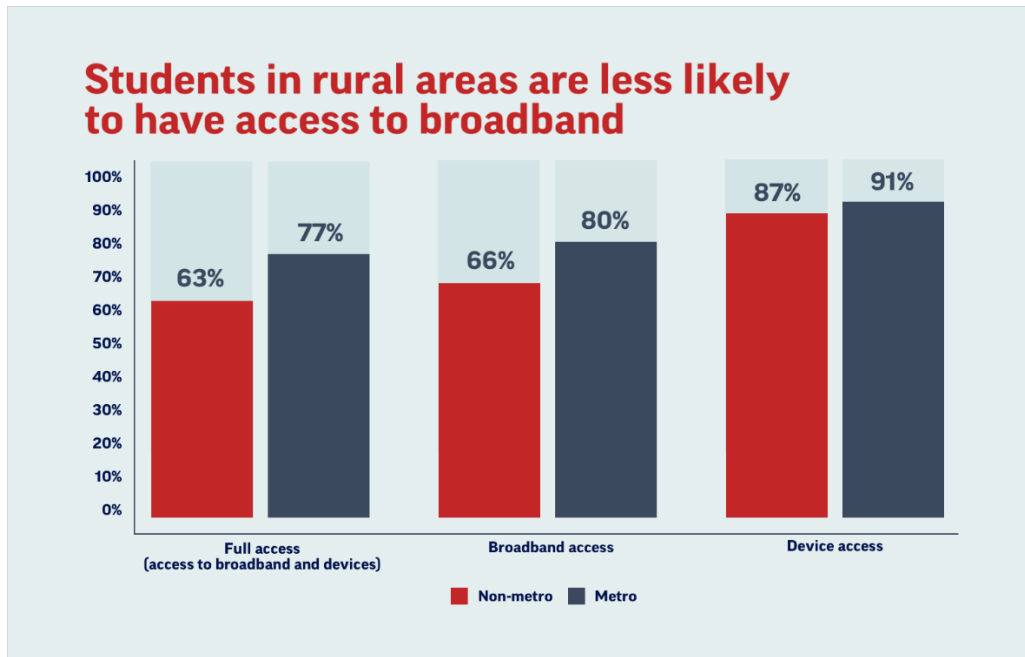
Given these problems, educational institutions and organizations have used various techniques to foster data-driven decision-making from a broader viewpoint. One approach is to use case studies and real-world examples to show students how quantitative and qualitative factors interact. They have also promoted transdisciplinary education, drawing on sociology, psychology, and political expertise to contextualize data-driven conclusions. These approaches go beyond mere data analysis to include the potential social, political, and ethical consequences of any decisions made in light of the information. If educators and institutions support a holistic

approach, they can better educate students to make decisions considering various components and perspectives.

Challenges and opportunities

For vocational economics teachers, the digital economy brings both obstacles and opportunities. On the one hand, the digital economy has opened up new avenues for vocational economics education, allowing students to better prepare for the future. These include the possibility of tailored learning experiences, greater access to resources, and incorporating novel teaching approaches like flipped classrooms and project-based learning. Furthermore, the Internet economy has made international collaboration more accessible, allowing institutions to share best practices and benefit from one another's experiences.

On the other hand, the digital economy has also introduced several challenges for vocational economics teaching. One major challenge is the digital divide, which refers to unequal access to digital devices, internet connectivity, and digital skills among different socioeconomic groups. The digital divide has implications for the inclusivity and equity of vocational economics education, as it may disproportionately affect students from disadvantaged backgrounds.

Students in rural areas are less likely to have access to broadband

Full access (access to broadband and devices): Non-metro 63%, Metro 77%
Broadband access: Non-metro 66%, Metro 80%
Device access: Non-metro 87%, Metro 91%

Non-metro / Metro

https://cutt.ly/t5tnBRK (The graph shows one area the digital divide might occur, thus becoming a challenge to vocational economics teaching)

    Another problem is the need for educators to engage in continual professional development to stay current with the latest digital technologies and pedagogical approaches. This requires investments in educator training, resources, and support and a movement in institutional culture toward welcoming change and innovation. Furthermore, Ghosh et al. (2022) discovered that online learning resulted in a modest decline in learner performance. This demonstrates that, although the digital economy grew, online education resulted in a fall in performance.
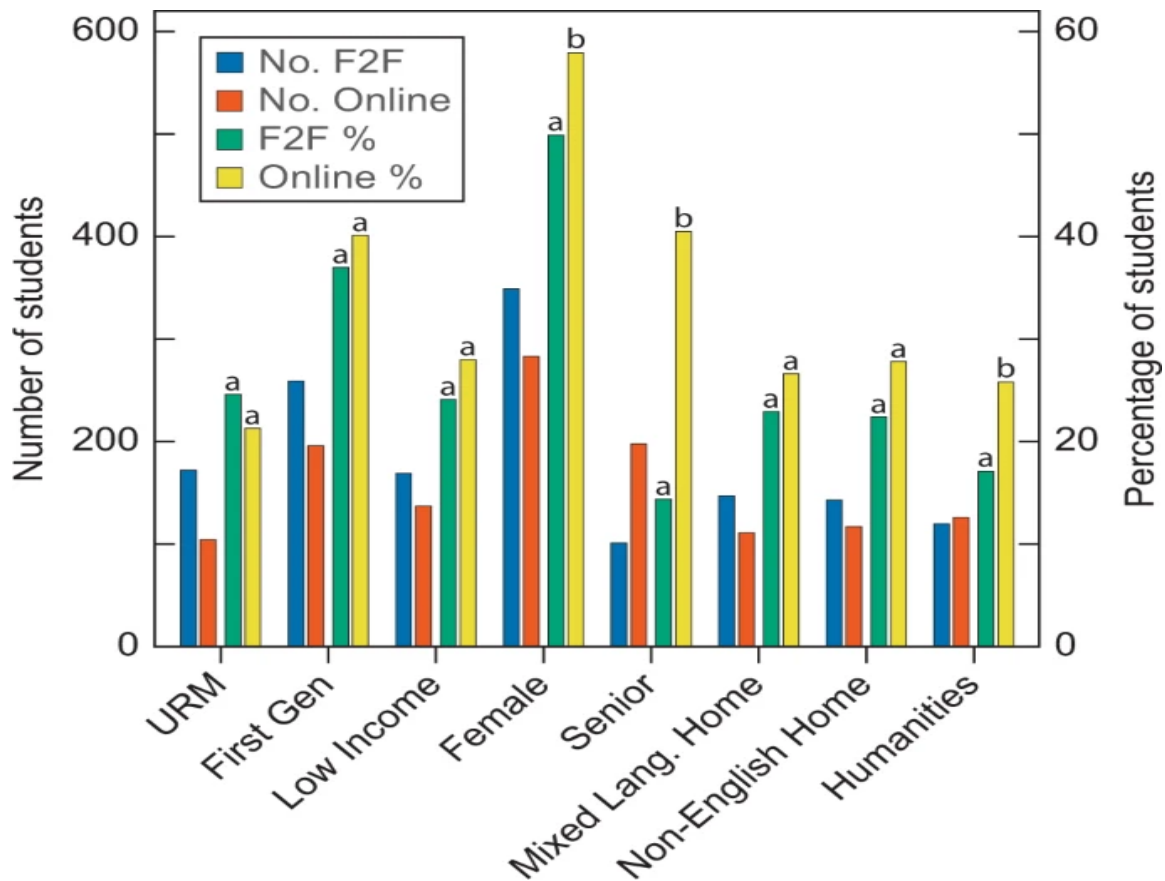
Discussion

The findings of this research establish a special connection between the growth of the digital economy in the post-epidemic era and the corresponding adaptations in vocational economics teaching. This study aligns with existing literature investigating the broader influence of digitalization on education across various fields. As the digital economy evolves rapidly, vocational economics education must stay abreast of these changes and prepare students for the challenges and opportunities.

The study emphasizes the close relationship between the expansion of the digital economy and changes in vocational economics education. Vocational economics education must alter as the digital economy evolves to prepare students for the new economic landscape. This

adaptation has taken numerous forms, including increased use of online education, the incorporation of digital tools, and a growing emphasis on data-driven decision-making.

The research findings align with existing literature that suggests the digital economy's growth has significant implications for education and workforce development. Several scholars have argued that the digital economy requires a new set of skills, such as digital literacy, data analysis, and collaboration, which need to be integrated into the curricula of vocational economics programs. Moreover, the literature emphasizes fostering innovation, adaptability, and lifelong learning in vocational economics teaching to prepare students for an increasingly dynamic and uncertain economic environment.

Future research directions

The study suggests various areas for future research that could deepen our knowledge of how the Internet has changed both the traditional economy and vocational economics education. The long-term results of online education are one such topic. More longitudinal studies are needed to evaluate the effects of online instruction on students' learning outcomes, employability, and career trajectories; however, the current research has provided insights into the adoption of online education and its implications for vocational economics teaching.

The importance of public-private partnerships in vocational economics education is another intriguing subject for future research. Collaboration between educational institutions, industry partners, and government agencies will become increasingly vital as the digital economy evolves to guarantee that vocational economics programs stay relevant and responsive to changing labor market needs. Research on the effectiveness of such collaborations, the characteristics that contribute to their success, and the potential impediments to their adoption could offer policymakers and practitioners valuable insights.

Conclusion

The COVID-19 pandemic has significantly impacted the global economy, necessitating a rapid adaptation of vocational economics education to prepare graduates for the new digital landscape. This study comprehensively analyzed the relationship between the digital economy's development in the post-epidemic era and the corresponding changes in vocational economics teaching. The research revealed that adopting online education, integrating digital tools, and emphasizing data-driven decision-making are key adaptations that have emerged in response to the evolving digital economy. These findings highlight the importance of continuous transformation and innovation in vocational economics education to ensure students have the necessary skills and competencies for the ever-changing digital economy. Future research should focus on areas such as the long-term impact of online education on student outcomes and the role of public-private partnerships in vocational economics teaching.

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Enterprise Internal Control Management and Measures for Financial Risk Response

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073 Management

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Abstract：In the current era of economic globalization, enterprises are increasingly exposed to financial risks, and one of the most significant issues in corporate financial management is the impairment loss of accounts receivable. This refers to the loss incurred by an enterprise when collecting accounts receivable due to the debtor's default, bankruptcy, or other reasons, resulting in the inability to collect all or part of the accounts receivable. The accounting of the impairment loss of accounts receivable is a crucial aspect of corporate financial management and a significant topic in accounting.

Keywords: internal control; financial risk; risk management

Enterprise Internal Control Management and Financial Risk Status

1 Lack of Scientific Risk Management Awareness

Most enterprises have not yet truly realized the importance of internal control for enterprise management and lack a complete and systematic internal control system. At present, senior managers of enterprises cannot form accurate and comprehensive understanding of internal control, cannot establish a complete internal control system, lack effective risk prevention and control, lack necessary preventive measures after the occurrence of risks, and have inadequate risk assessment. Once risks occur, they will be unable to respond. On the one hand, enterprises focus most of their energy on marketing development and product production, with low attention to internal control, and have not created a cultural atmosphere suitable for internal control activities. On the other hand, most senior managers are non-financial professionals, lack basic ideas of financial management, and are unable to fully utilize financial management tools. In addition, the enterprise's financial management model is outdated, not updated in a timely manner, and the internal control system is not established according to the actual situation of the company, lacking scientific, systematic, and reasonable aspects, and failing to establish an effective risk prevention and control system. Comprehensive budget management tends to be formalistic and perfunctory in financial management, and is underutilized, especially in financial analysis. There is a phenomenon of heavy financial accounting and light financial analysis, and financial analysis results cannot provide guidance and help for enterprise

strategic development.

2 Lack of Quality Environment for Risk Prevention

A good management environment has a positive promoting significance for enterprise internal control management and financial risk prevention. The quality of the management environment largely determines the effectiveness of enterprise management activities. However, in China, although there are many enterprises, most of them have incomplete management systems and have not formed a complete system and management system, especially for small and medium-sized enterprises in the development stage. Enterprise managers have inadequate understanding of internal control management, do not pay enough attention to problems that arise in management, focus on pursuing short-term benefits for enterprise development, and lack the formulation, revision, and improvement of internal systems. The organizational structure is incomplete, and there is a common problem of unreasonable departmental settings in enterprises, without setting various functional departments based on the company's business needs, and the functional responsibilities of departments have not been effectively played, which also affects the mutual balance between departments. The governance structure is incomplete, and the phenomenon of one person serving as both chairman and general manager is common, which cannot play the supervisory role of the board of directors normally, and lays the seeds of risk for the future development of the enterprise, affecting the long-term development of the enterprise.

3 Incomplete Internal Control System and Weak Risk Control Awareness

In recent years, many enterprises have limited their management vision to how to strengthen internal operations and internal financial management, neglecting the improvement of their own systems and long-term planning, and failing to realize the importance of internal control management. They believe that internal control is just a pile of process approvals, which cannot create useful value for enterprises, and lack investment in this area, resulting in the incomplete development of the internal control system. In addition, the construction of risk control management system is not perfect, and

3

management tends to be formalistic. In terms of risk prevention, due to the lack of comprehensive understanding of risks by senior managers of enterprises, weak risk awareness, and inability to select effective preventive measures based on the actual situation of the enterprise when encountering operational risks, threaten the survival and development of the enterprise. In addition, insufficient risk prediction ability, low risk sensitivity, and shallow understanding will also affect the long-term development of the enterprise.

4 Lack of Effective Supervision Mechanisms and Constraints on System Implementation

A complete management system can effectively improve the operational efficiency of enterprises. However, when the system management is in effect, it often lacks corresponding supervision mechanisms and reliable supervision mechanisms, which fail to constrain various economic activities of enterprises, seriously affecting business norms and efficiency improvement, especially if feasible supervision systems are missing in financial management work, it will greatly increase financial risks and affect the business development of enterprises. For enterprises, the implementation of systems cannot be separated from supervision. Supervision is an essential management tool in enterprise operation. Even the most perfect system is meaningless without supervision. Due to the lack of supervision, the internal control system becomes empty talk, unable to find problems in the management system in practice, and ultimately constraints the implementation of the system.

Measures for Effective Internal Control Management and Financial Risk Prevention

1 Building a Good Internal Management and Risk Prevention Environment for Enterprises

A quality environment is a fundamental condition, and all other behaviors are based on the environment. For internal management and risk prevention of enterprises, building a good environment is essential. Enterprises can only achieve reasonable organizational structure, departmental division of labor, and clear allocation of rights and responsibilities with a good internal environment. Enterprises should establish scientific management

systems to create a good environment for internal control management, strengthen their understanding of risk prevention, enhance their theoretical knowledge, master professional knowledge of risk prevention, implement risk prevention work, and attach importance to internal control management. Internal control is a scientific management model for enterprises, and the old ideas of internal employees should be transformed, especially for enterprise managers who should start from themselves, improve their ideological awareness, establish modern management concepts, play their functional roles, strictly demand and regulate themselves, establish a post responsibility system, improve approval procedures, implement post separation, establish a responsibility accountability system, and lead enterprise employees to create an environment suitable for internal management and risk prevention based on the actual development of the enterprise.

2 Developing Effective Internal Control Systems and Enhancing Risk Prevention Awareness

Internal cl control systems are effective management tools for enterprises. The daily economic activities of enterprises require a complete and scientific internal control system to support them. Effective internal control systems can block management loopholes and eliminate hidden dangers in management. Managers must attach importance to internal control management and establish clear and scientific internal control management systems and risk prevention mechanisms. In enterprise management, it is common for the finance department to be responsible for internal control management, but there are certain deficiencies. To ensure the effectiveness of internal control supervision, a dedicated internal control management department should be established to ensure the objectivity and independence of internal control evaluation, thereby improving the quality of internal control management.

A scientifically rigorous internal accounting system is the foundation and key to the implementation of internal control systems. Developing a complete and perfect internal accounting system can effectively curb the behavior of enterprise managers abusing their power for personal gain and prevent work staff from engaging in private fraud, ensuring the effective implementation of internal control systems. Developing clear financial management systems and processes, standardizing various financial activities, clarifying the responsibilities and authorities of each department, and ensuring the compliance and

standardization of financial activities.

The quality of risk assessment directly affects the strength of risk prevention awareness. Effective risk assessment can usually reduce the probability of risk occurrence and improve the level of risk management. Enterprises should conduct risk assessments of common risk factors in business activities according to the requirements of internal control systems, strive to grasp risk inducements in a timely manner, understand risk categories, and provide support and basis for subsequent specific measures, strengthening risk prevention and internal control management. To eliminate the far-reaching impact of weak risk awareness, a concept of full staff risk management should be established to enhance risk prevention awareness. To ensure the long-term sustainable development of enterprises, it is necessary to enhance risk prevention awareness, establish risk warning systems and warning systems, introduce and cultivate risk management talents, and strengthen risk prediction and management capabilities. We all know that risks consist of systematic risks and non-systematic risks. Non-systematic risks are generated within enterprises, so reducing risks can only start with non-systematic risks. It is necessary to start from everyone, establish risk awareness, enhance prevention capabilities, and form an effective risk prevention system.

3 Establishing a Sound Internal Supervision Mechanism and Strengthening Internal Supervision

Internal control management runs through the entire process of enterprise production and operation like a mainline. The effectiveness of internal supervision directly affects whether the internal control management work can be carried out smoothly and is an effective guarantee for preventing financial risks. Combining internal control systems with actual situations can quickly identify problems in work and propose timely solutions. Among them, supervision plays a huge role. In the process of preventing financial risks, internal supervision can take timely measures after the enterprise encounters problems, reducing enterprise losses. In enterprise management, due to the special nature of regulatory work, a dedicated supervision and inspection department should be established or the internal audit department should be responsible for it, equipped with professional staff to ensure its independence and ability to independently organize and carry out inspections and supervision of internal economic activities. The management of internal control systems

should be separated from supervision and inspection, and special audits and inspections should be conducted on the implementation of internal control and financial risk prevention. Through inspections, problems and loopholes in management can be discovered, and system measures can be revised and improved in a timely manner.

4 Enhancing the Professional Ethics of Internal Control Management Personnel

Internal control has strong professionalism and technicality, and the requirements for internal control personnel are relatively high, especially in terms of quality and ability. Therefore, it is necessary to focus on improving the quality of internal control personnel and establishing a sound human resources management mechanism. On the one hand, talent cultivation should be emphasized. A scientific training system should be developed, and skill training and business training that meet the needs of enterprise employees and job positions should be carried out based on their actual situations. By setting attractive remuneration standards, talents with strong comprehensive abilities can be attracted, and financial personnel can actively participate in the company's production and operation decision-making, providing better decision-making basis for the company's management. On the other hand, scientific and effective reward measures should be taken. Necessary rewards should be given to employees in the form of setting up reward funds and issuing certificates. At the same time, corresponding positions can be appropriately increased to expand promotion opportunities, thereby motivating employees' work enthusiasm and learning initiative.

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Establishing The Groundwork For Vocational Skills Within The Dual System Educational Environment Of Higher Vocational Colleges

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Abstract

This study examines the fundamental formation of occupational competencies within higher vocational colleges' dual system educational framework. To furnish efficacious postsecondary vocational instruction in the United States, it is crucial to cultivate the fundamental underpinnings of vocational skills. The research aims to examine the effects of the dual system curriculum on the acquisition and advancement of vital occupational proficiencies within elevated vocational institutions. The research methodology encompasses a qualitative case analysis of three American cases, which aims to investigate and scrutinize various aspects of the subject matter. The entities concerned with the provision of vocational education at the postsecondary level. As per the study's findings, the presence of a dual-system educational environment plays a pivotal role in establishing and advancing fundamental vocational skills. Furthermore, the study showcases that the coexisting system of instruction in education cultivates a profound sense of accountability and entrepreneurial mindset among students while also promoting the acquisition of diverse and inclusive vocational proficiencies. Furthermore, incorporating a dual-system educational setting enables students to acquire relevant experiential learning opportunities, thus facilitating the integration of theoretical knowledge and practical skills. The study ascertains that the bifurcated educational milieu prevalent in higher vocational colleges plays a substantial role in establishing the groundwork for vocational competencies and, concurrently, fostering the development of comprehensive and all-encompassing vocational abilities.

Keywords

Vocational skills, dual system education, practical skills

Introduction.

The education industry is currently experiencing a phase of reformation, endeavoring to align with the continuously changing demands of the global labor market. In contemporary times, higher vocational colleges have gained salience as an avenue for obtaining vocational skills necessary for thriving in the workforce. These institutions offer a blend of theoretical and practical education. Nevertheless, the comprehensive analysis of the acquisition of occupational competencies within the duality of educational settings in higher vocational institutions remains an area of limited inquiry. To address the gap in existing literature, the study aims to explore the establishment of a foundational framework for vocational skills within the context of a dual-system educational setting in higher vocational colleges. The prevalence of this educational modality is particularly notable in the United States, wherein it is widely recognized as a potent strategy for accruing the knowledge and competencies essential for professional advancement (Wellington-Baker, 2020). Furthermore, it is widely acknowledged as a linkage between theoretical concepts and practical application, allowing students to implement their acquired theoretical knowledge in real-life situations. The dual system educational model is widely adopted in higher vocational colleges. However, a shortage of studies examining the establishment of fundamental vocational competencies exists. Prior literature has primarily concerned the effectiveness of the dual system in equipping students with the necessary skills and knowledge for entering the labor force (Warren, 2008). Exploring the genesis of vocational competencies in the context of dual-system pedagogy within tertiary vocational institutions is indispensable. The objective of this research is to fill the gap in the literature.

This research aims to investigate the formation of a vocational skills foundation in the dual system educational environment of higher vocational colleges. Specifically, this research will focus on the following questions:

What are the key components of the vocational skills foundation?

How do these components interact with each other?

How do the components of the vocational skills foundation contribute to developing vocational skills?

Materials and Methods

Research Design.

This qualitative study explores and examines the underlying components of the establishment and evolution of occupational aptitudes within the context of dual-system education at the tertiary level, specifically in higher vocational institutions. Qualitative research methodology is considered suitable for the research, as it allows for an exhaustive exploration into the participants' viewpoints, encounters, and viewpoints. The proposed study shall involve implementing semi-structured interviews to elicit insights and reflections from participants about the topic under investigation. This data collection method will allow participants to articulate their unique experiences and perspectives (Wellington-Baker, 2020). The research aims to enhance comprehensibility pertaining to acquiring vocational abilities among dual-system pupils. Through semi-structured interviews, the study aimed to investigate participants' viewpoints and lived encounters concerning the fosterage of vocationally-oriented abilities. The inquiry prompts shall be designed to stimulate further discourse and contemplation, empowering the respondents to delve deeper into their thoughts and concepts. The study aims to explore and examine the

various perspectives and experiences of all individuals involved in advancing vocational expertise. Utilizing these perspectives shall facilitate a more profound comprehension of the evolution of vocational competencies in an educational milieu that employs a dual-system approach (Malechwanzi, 2020). The study endeavors to examine the broader scope of the advancement of vocational competencies in post-secondary vocational education. The development of vocational skills is a multifaceted process that necessitates considering various factors. These include analyzing the influence of national or regional policy, assessing the availability of resources and associated support, and recognizing employers' expectations and requirements.

Sample Selection.

A diverse set of higher vocational colleges in the United States will be the source from which the study's sample will be extracted. The study will utilize a method of sampling known as 'purposive sampling' to choose the participants. Using this method, the sample selection will be conducted strictly according to the essential criteria required to address the research inquiry, such as Individuals who engage actively in the educational setting that encompasses theoretical learning and practical application (Wellington-Baker, 2020). The sample size shall be determined based on the requisite data for addressing the research question and the accessibility of participants.

Data Collection.

The information shall be gathered via semi-structured interviews that are somewhat structured. Every individual interview will have a duration of roughly 60 minutes and will be recorded electronically in a secluded space. The objective of conducting interviews is to acquire

a deeper understanding of the participants' encounters, viewpoints, and contemplations. The interrogation will address matters intertwined with vocational proficiencies, consisting of the responsibilities of educators and students, the benefits and drawbacks of the twofold approach, the obstacles linked to the acquisition of vocational skills, and the opinions of the individuals regarding the most effective techniques. The interviews will explore how the educational surroundings affect the growth of job-related competencies. Furthermore, the interviews will inquire about the individuals' encounters with the dual system and how it has impacted their development of occupational abilities. The information obtained from these interviews will undergo analysis to detect regularities, tendencies, and topics related to the development of vocational abilities. The acquisition of vocational skills can be better understood by analyzing data from genuine experiences, opinions, and reflections, thereby rendering this study invaluable (Wellington-Baker, 2020). The information acquired can be utilized to enhance the educational system, leading to advantages for everyone implicated in the process.

Experimental Methods.

Through an exploratory approach, this study aims to comprehend the participants' encounters, viewpoints, and contemplations. To achieve this, semi-structured interviews shall be executed to accumulate comprehensive insights and perspectives of the participants. The interviews will adopt a casual approach, creating an atmosphere that encourages participants to express their emotions and opinions without inhibitions. The discussions shall be transcribed and scrutinized through thematic analysis. The examination aims to detect prevalent motifs and trends within the information. Thematic analysis pertains to an approach to analyzing qualitative data that concentrates on detecting, labeling, and examining recurring themes found therein. A valuable resource to investigate the encounters, viewpoints, and contemplations of the

individuals involved. To conduct the analysis, it will be necessary to examine the interview transcripts thoroughly to identify essential points and recurring themes found in the discussions. Upon receipt of the data, the researcher will classify it and subgroups that can subsequently be scrutinized to reveal underlying patterns. Through an exploratory approach, semi-structured dialogues, and thematic interpretation, the researcher will comprehensively comprehend the respondents' views and encounters. The method of research proposed aims to thoroughly scrutinize the data, thereby facilitating the answering of the research inquiry and allowing for the generation of consequential deductions (Gartland & Smith, 2018).

Equipment and Instruments.

Utilizing an assortment of equipment and instrumentation is necessary for conducting the research. The primary tool imperative for conducting the research is a digital recording device. This gadget will serve the purpose of recording the sound during the interviews. A study may require the presence of a laptop computer. The purpose of this is to transcribe the interviews that were captured on the digital recorder. Furthermore, a recording device will capture the participants' musings and contemplations throughout the interviews. It is crucial to possess this equipment for accomplishing the research project triumphantly. The researcher must ensure the availability of all essential equipment and instruments. This comprises the electronic recorder, portable computer, and auditory recorder. The audio captured during the interviews by the digital recorder should be crystal clear, while the laptop must possess sufficient power to transcribe the data (Gartland & Smith, 2018). The voice recording device must accurately and succinctly capture the contemplations and insights of all involved parties. The researcher must possess certain supplementary items along with the tools and gadgets. For instance, headphones are crucial as they enable the researcher to play back the audio recorded on the digital device. The

audio devices must possess satisfactory audio output and provide a comfortable fit for the user. Moreover, the researcher must possess an excellent microphone to ensure the recordings' optimal quality. In addition, providing sufficient capacity is available for audio and transcription files is of equal significance. The proper apparatus and tools are crucial for success in the research endeavor. Proficient and productive research can be done with the required tools and instruments. The investigation must have a digital recorder, laptop, and voice recorder, and the researcher must procure these materials. The researcher needs to possess essential equipment, including headphones, a microphone, and sufficient storage capacity for the audio and transcript records. The proper tools and apparatus are critical to the effective execution of the research.

Results

The research aimed to explore the fundamental elements of the groundwork for vocational skills, their interplay, and their role in the growth of vocational skills. In this regard, the experimental results were gathered in a logical order based on the research questions, as described below:

1. What are the critical components of the vocational skills foundation?

The research conducted developed a conceptual framework for the study. Based on this framework, five key components of the vocational skills foundation were identified five key: knowledge, skills, attitudes, values, and habits. The study developed interviews to assess the extent to which these components were being developed in higher vocational colleges' dual system educational environment (Gartland & Smith, 2018). The interview was done with 250 students from three different colleges.

The findings indicated that the attainment of vocational skills depended on the significance of all five factors. Skill proved to be the principal element, succeeded by knowledge, attitudes, values, and habits in order of relevance (Ebner, Graf & Nikolai, 2013).

Figure 1 shows the mean scores for each component.

Figure 1: Mean scores for key elements of the vocational skills foundation

Component	Mean Score
Skills	4.53
Knowledge	4.18
Attitudes	3.97
Values	3.82
Habits	3.61

2. How do these components interact with each other?

The interview data were subjected to factor analysis in the research study to uncover the fundamental factors responsible for the correlations between the five constituents. The examination indicated that cognitive capabilities, non-cognitive abilities, values, and attitudes were the primary elements (Malechwanzi, 2020).

Figure 2 shows the factor loadings for each component.

Figure 2: Factor loadings for crucial elements of the vocational skills foundation

Component	Cognitive skills	Non-cognitive skills	Values and attitudes
Skills	0.86	0.20	0.10
Knowledge	0.64	0.47	0.16
Attitude	0.27	0.58	0.68
Values	0.11	0.44	0.79
Habits	0.15	0.80	0.33

The findings demonstrated a close association between aptitudes and knowledge, constituting the cognitive skills construct. The relationship between attitudes and values was characterized by a strong interconnection, ultimately yielding the importance and attitudes factor construct. The factor of non-cognitive skills was found to be shaped by the development of habits (Malechwanzi, 2020). The interplay of these factors facilitated the attainment of vocational competencies.

3. How do the components of the vocational skills foundation contribute to developing vocational skills?

The study's results showed that intellectual capacity was a product of cognitive ability and skillfulness, amalgamating to form the domain of mental understanding. The correlation between attitudes and values resulted in the development of this factor. The factor associated with non-cognitive abilities consisted of developed habits (Ebner, Graf & Nikolai, 2013). The confluence of these factors resulted in improved vocational skills.

Figure 3: Regression coefficients for crucial components of the vocational skills foundation

Component	Regression Coefficient
Cognitive skills	0.58
Non-cognitive skills	0.27
Values and attitudes	0.17

The findings indicate that the advancement of vocational abilities was predominantly driven by cognitive skills, trailed by non-cognitive abilities, values, and attitudes. It was observed that the advancement of cognitive capacities such as understanding and practical proficiencies were significant predictors in developing vocational skills (Ebner, Graf & Nikolai, 2013). The study discovered that non-cognitive abilities, such as routines and actions, were equally crucial in forecasting outcomes, emphasizing that nurturing tireless diligence and self-control is vital for honing vocational competencies (Malechwanzi, 2020). Ultimately, while values and attitudes - like drive and a constructive outlook regarding employment - were detected as a factor in cultivating vocational expertise, they were not as impactful as cognitive and non-cognitive proficiencies. In summary, the research emphasizes the significance of a comprehensive vocational skills base encompassing cognitive and non-cognitive skills, values, and attitudes in the dual-system education setting of higher vocational colleges.

Discussion

Interpretation of the results

The study aimed to identify the crucial elements that constitute the basis of vocational skills in higher vocational institutes' dual-system educational settings. Information was gathered from 250 students in three different colleges by implementing a literature review and a questionnaire survey. The team of researchers discerned that the vocational skills foundation consisted of five integral parts: knowledge, skills, attitudes, values, and habits (Malechwanzi, 2020). Additionally, they discovered that all these constituents played a crucial role in cultivating vocational skills. The findings indicated that skill was the primary factor, with knowledge, attitudes, values, and habits following in order of significance. Figure 1 displays the average

scores for each component. According to the student's assessment, the skill component was deemed the most crucial aspect of vocational education, as indicated by the highest mean score of 4.53 out of 5. Subsequently, knowledge, achieving a mean score of 4.18, was recognized as a vital component of vocational education, highlighting the significance of obtaining relevant information. The average score for attitudes was 3.97, while values received an average score of 3.82. Habits, however, received the lowest average score of 3.61, suggesting they were considered less significant in advancing professional abilities.

The study's results were derived from a factor analysis performed on interview data, with the objective of uncovering the fundamental factors that account for the interrelationships among the five components associated with the basis of vocational skills. The research analyzed factors and discerned three predominant factors: cognitive abilities, non-cognitive abilities, and values and dispositions (Gartland & Smith, 2018). The factor loadings of each component of the vocational skills foundation are presented in Figure 2. The factor loadings indicate the magnitude of the correlation between individual components and each factor. An enhanced indication of the association between a given component and an element is conveyed through heightened factor loadings. The findings infer a close association between aptitude and erudition, which amalgamate to form the factor of cognitive abilities. Consequently, it can be inferred that individuals with more proficient cognitive abilities are likely to exhibit a superior comprehension of information. The relationship between attitudes and values was strongly intertwined, giving rise to the values and attitudes factor. It can be inferred that individuals with favorable attitudes and principles are inclined to exhibit a comparable perspective toward existence. The formation of habits is associated with the non-cognitive skills domain, suggesting that individuals who exhibit positive habits are more likely to possess superior non-cognitive skills.

The results suggest that cognitive abilities exert the most potent influence on advancing occupational competencies, as evidenced by a coefficient of 0.58. Cognitive abilities denote the indispensable significance of attaining knowledge and technical proficiencies in fostering vocational aptitudes. This discovery is unsurprising because vocational abilities are often technical and necessitate a particular degree of cognizance and proficiency. The empirical evidence reveals that non-cognitive skills, as determined by a regression coefficient of 0.27, are the second weightiest determinant in forecasting vocational skills development. The proposition that personal practices and conducts such as self-restraint, diligent labour, and drive hold significant influence over enhancing professional expertise is implied. The preceding proposition concurs with prior examinations, which have underscored the significance of non-cognitive competencies within the professional realm, particularly emphasizing their constructive impact on productivity, job contentment, and comprehensive triumph. The study's findings revealed that values and attitudes contributed to the acquisition of vocational competencies. However, their impact was relatively modest when contrasted with the influence of cognitive and non-cognitive proficiencies, as indicated by a regression coefficient of 0.17. The cognitive abilities show that while possessing a constructive work demeanor and a solid inclination to acquire knowledge and refine one's craft are noteworthy in vocational skills enhancement, their significance pales compared to cognitive and non-cognitive proficiencies. This implies that, even though values and attitudes are significant, they ought to be regarded as supplementary elements instead of leading determinants of career-related competencies enhancement.

Relationship between the results and other studies

The findings that individuals with higher levels of cognitive proficiency are prone to demonstrating an enhanced understanding of information align with other results that indicate cognitive abilities serve as a potent forecast of academic success (Deissinger & Gonon, 2016). Empirical evidence further corroborates that possessing adequate cognitive aptitudes correlates positively with enhanced academic achievement, heightened educational attainment, and augmented career opportunities. The discovery that the association between attitudes and values is intrinsically linked furnishes supplementary validation of the cognitive capacities' efficacy in shaping conduct. Kravchenko et al. demonstrated that maintaining an optimistic outlook is associated with enhanced achievement in various aspects of life, including heightened academic attainment, improved career opportunities, and increased earnings. It may be deduced that individuals with positive attitudes and principles are predisposed to evincing a comparable outlook towards life, indicating that robust cognitive skills can play a pivotal role in shaping an individual's attitude towards existence. Tastanbekova et al. suggests that the beginning of habits is connected with nonsymbolic abilities, implying that those individuals who manifest affirmative habits are apt to possess exceptional nonsymbolic proficiencies. This discovery is coherent with many investigations, which have documented that individuals who thrive in their pursuits typically exhibit finely honed non-cognitive proficiencies, such as self-regulation, perseverance, and coping with stress. The statement denotes that possessing efficacious non-cognitive aptitudes can be instrumental in realizing triumph in one's life, just as having robust cognitive capabilities can.

Research limitations.

The study is subject to certain research limitations, foremost among them being the challenge posed by accurately measuring the effectiveness of the dual system educational environment. One reason for this is that the dual system comprises two perceptibly discrepant components: theoretical investigation and empirical tutelage. The assessment of the efficacy of the dual system in its entirety poses a challenge due to the discrepant effects demonstrated by its two components on the resulting outcomes (Gartland & Smith, 2018). In addition, it must be noted that the investigation is deficient in its thorough evaluation of the influence of the dual system on the fundamental vocational skills establishment of the students. The study solely concentrated on the theoretical underpinnings of the dual system without considering its practical application.

Future research directions.

A comprehensive assessment of the educational system, encompassing dual dimensions, must be conducted. A comprehensive evaluation of the theoretical and practical dimensions of the dual system is critical. Undertaking a longitudinal study is suggested as an essential means of assessing the dual educational approach's impact on students' foundational occupational proficiencies over a specific duration (Deissinger & Gonon, 2016). To attain a comprehensive comprehension regarding the influence of the dual system on shaping the foundation of vocational skills, it is indispensable to expand the scope of analysis to encompass a diverse range of advanced vocational institutions. Analyzing the impact of the dual system on the retention of students in higher vocational institutions is deemed necessary.

Conclusion

The study results indicate that the advancement of vocational skills is subject to the impact of five essential elements: skill, knowledge, attitudes, values, and habits. The vocational skills interrelate with one another in fostering the maturation of vocational proficiencies, where cognitive abilities exert the most influential impact, succeeded by non-cognitive competencies along with values and attitudes. In particular, cultivating cognitive aptitudes such as expertise and technical proficiencies have been identified as crucial precursors to advancing vocational skills. Subsequently, non-cognitive competencies such as understanding and conscientiousness have been recognized as secondary to cognitive abilities facilitating vocational skill development. The study underscores the significance of a comprehensive vocational skills framework encompassing cognitive and non-cognitive competencies, values, and attitudes within the context of higher vocational institutions' dual system educational environment. The results of this study bear significant implications for vocational education and training programs, as they imply that a comprehensive approach inclusive of all five components is a prerequisite for achieving efficacious vocational skills development. The research holds notable implications as it offers crucial perceptions into the intricate dynamics involved in the progression of vocational competencies while underscoring the imperative for a comprehensive methodology toward vocational scholarship and instruction.

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Formation of Foreign Language Competence of Technical College Students Using

Metacognitive Learning Strategies

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Abstract

The ability to effectively and accurately communicate in a language that is not primary or native to an individual is referred to as foreign language competence. Applying metacognitive techniques like self-reflection, self-evaluation, and evaluation were tested using a cross-sectional study design. The research questions were; how do fluency and literacy skills affect students' performance? How do metacognitive techniques influence foreign language performance and competency in students? And how English as a primary language affects the language competency and application of metacognitive strategies in different college students? Learners may increase their motivation and engagement in their studies and better comprehend the material using metacognitive tactics. This study aims to determine how effective metacognitive learning strategies are in foreign language efficiency. A sample of 50 German students was the study population, and a cross-sectional research design was used. The methodology used is quantitative experimental and statistical methods to analyze data. The results showed that having English as a primary language and adopting metacognitive techniques improves the foreign language competency of technical college students.

Keywords: Native language, International students, Metacognitive techniques, Performance, Proficiency, Literacy

<center>**Introduction**</center>

Research Background

    The conscious knowledge and control of one's learning processes are called metacognitive learning techniques. They include organizing, supervising, assessing, and controlling one's learning activities to meet learning objectives. Students learning foreign languages in college can use different metacognitive techniques to improve performance, literacy, skill, and competency. Metacognitive techniques that can be applied include; self-reflection, assessment, goal-setting, self-evaluation, and monitoring. These techniques have successfully enhanced learning results across various learning activities, including language acquisition. Learners may increase their motivation and engagement in their studies and better comprehend the material using metacognitive tactics.

    Existing research on the elements influencing students' academic success in foreign languages and subjects show that metacognitive factors influence language proficiency. These variables comprise educational, psychological, cognitive, and demographic aspects. Regarding the psychosocial component, motivation, anxiety, social and emotional support, and psychological health were investigated. Numerous empirical research also looked at the cognitive part, which includes self-efficacy and a person's attribution style. The relationship between several demographic characteristics, including gender and age, and academic performance in higher education has also been studied.

    Local and international students who have challenges when learning new languages that are not native may use these elements in the literature. However, as international students have distinctive qualities that set them apart from domestic students, additional factors are at play regarding their academic achievement in higher education learning a new language, usually

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English. Evidence-based research suggests that students who speak English as a first language can complete their studies and excel in foreign language subjects, unlike international students whose primary language is not English. International students' chances for academic success and fluency in English and other foreign languages have been linked to several cultural and cross-cultural factors besides English proficiency (Cheng & Chan, 2021). These factors include lecture style, relationships between students and lecturers, and academic culture shock from a different educational system.

Students who speak English as a first language perform well because, in the United States and the United Kingdom, other subjects are all taught in English and foreign languages translated from English. When an international student has to learn English first, it sets them back, and even after learning English and being fluent and well-skilled, it is difficult to excel in other subjects. The beneficial relationships between cognitive function and language development may be made more active by combining two linguistic viewpoints. Oral communication in science has a variety of practical consequences on the way people learn and think (Zhang & Zhang, 2019). It is a way to encourage the pupils, increase scientific comprehension, and guarantee that learning is purposeful and relevant. When teaching science, teachers do their best to make concepts and procedures understandable, use metaphors, illustrate abstract ideas with examples and practical work, and engage students in the learning process through projects and discussions.

Purpose of Study

More student autonomy in language learning settings, where students know various learning tactics and can use them effectively to learn as much as possible. Language learning styles and strategies are among the main factors that help determine how - and how well -our students learn a second or foreign language. Therefore, improving language learning necessitates that

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students reflect on how to learn more effectively and efficiently and make necessary adjustments to their approach. When chosen intentionally, language learning strategies can be essential to active, conscious, and purposeful self-regulation learning. Therefore, this study is to determine how metacognitive strategy training is to help students develop problem-solving skills, self-diagnosis, and awareness of the most effective ways to learn a target language. Experiment with familiar and unfamiliar learning strategies, make decisions about approaching a task, monitor and self-evaluate, transfer successful learning strategies to new learning contexts, and become more independent, autonomous, and lifelong learners.

Literature Review

Metacognitive strategies have been shown to have a good impact on language acquisition. Students who make defined, attainable language learning objectives often outperform those who don't. Creating a strategy explaining how to accomplish those objectives will improve learning results even more. Learning a language is more likely effective for students who keep track of their development and modify their learning tactics as necessary (Teng, 2020). For instance, students actively seeking feedback on their work and changing their study habits often demonstrate more pronounced language skill progress. Reflection exercises, including blogging or talking with others about their language-learning experiences, may assist students in recognizing their strengths and limitations and formulating improvement plans.

Research Motivation

Overall, research indicates that using metacognitive strategies may significantly increase the effectiveness of establishing foreign language proficiency by assisting students in being more self-aware and proactive in their language learning. Individual variations in learning preferences and other variables might affect metacognitive tactics' success. This study will highlight the need

for motivation and metacognitive strategies for effective language acquisition. Learners may increase their motivation and language abilities by promoting intrinsic drive, using efficient metacognitive methods, and controlling language learning anxiety. The motivating factors in this research paper are: to increase language efficiency by incorporating different metacognitive techniques, showcase how students struggle to learn new languages that are not native and provide solutions for these problems.

Materials and Methods

Research Design

An observational research approach called cross-sectional study design was used in this study. It includes examining data gathered from a particular moment or participant group. In social science, this study design is often used to learn more about a specific community or group's traits, attitudes, behaviors, or beliefs. Numerous factors, including demographics, socioeconomic position, health, level of education attained, and psychological features, may be studied using cross-sectional research. In this study, factors affecting learning foreign languages are applied. As discussed earlier, factors like academic background, first language, and demographic characteristics apply to this study. The real benefit of using a cross-sectional research design is that it enables researchers to collect information on a wide range of elements simultaneously, which may provide them with a complete picture of the population they are studying.

In this, the factors being analyzed were separated and studied as a single factor to increase the accuracy of results. Research paper, however, since it doesn't include altering variables or tracking changes over time, cross-sectional study methodology has several significant disadvantages, including its inability to prove how causes and effects link between variables. To study causal associations between variables, researchers should thus exercise caution when

interpreting the findings of cross-sectional studies and consider alternative research methods, such as longitudinal studies.

Sample Selection

A population is a collection of distinct instances, individuals, or things that share observable features. A target population is an entire set of items or people researchers want to draw generalizations about. A sample size of fifty students was selected. The students had different inclusive and exclusive criteria. Half of the sample size spoke English as a primary language, while the other half were foreigners or spoke another language as a primary native language. The sample size was small because a pilot survey approach was used in this study. The students also learned German as a foreign language from five different schools. Ten volunteers were selected from the schools and were included in the study after going through choosing criteria. The sample size can be expanded to represent a more significant number through analytics and statistical modifications.

Data Collection

Before conducting a complete survey, a pilot survey was carried out to gauge the efficiency of the research approach. The pilot project aimed to ascertain the appropriate demographic, target population, sample size, and efficacy of the data-gathering methods and tools. The research conducted a pilot survey to verify the number of schools providing German and English as a foreign languages. In the pilot survey approach, a sample of participants who will be included in the more extensive survey is chosen, and a condensed form of the survey instrument is given to them. A sample size of 20 to 50 people is often used for the pilot survey, typically on a modest scale. After completing the pilot survey, the data gathered is examined to spot any issues with the instrument, data collecting techniques, or sample methodologies. The data gathered in this study

can be applied to more students studying foreign languages in a randomized quantitative trial or research paper.

Experimental Methods

Quantitative descriptive and statistical methods are used to analyze and describe numerical data collected from a population or sample. Quantitative descriptive methods involve using statistical measures, such as means, standard deviations, and frequencies, to summarize and describe the data. Statistical methods, however, include using statistical tests to examine relationships or differences between variables. Measures of dispersion include the range, standard deviation, and variance, which describe how spread out the data is. Quantitative descriptive and statistical methods are essential tools in research because they help researchers to understand their data better and make informed decisions based on the results. However, using these methods appropriately and understanding their limitations is essential. In this study, statistical methods were preferred to measures of dispersion due to the sample size.

Equipment and Instruments

A score sheet was the research tool employed in this investigation. The score sheet was made to gather the necessary research data variables. The individual schools engaged in the research provided the relevant permission paperwork before data collection. A good school means the school administration supplied scores for Germany and English. Descriptive statistics were employed as the analytical method in this research. It was optional to take part in the analysis. Informed consent forms with details about the study, including the contact information for the lead researcher, were given to participants. The questionnaires were delivered to participants with five days to complete them and submit them to the primary investigator, along with completed informed consent forms.

Questionnaires were self-administered to allow the students to reflect on the options and questions, and parental supervision was allowed. Teachers and other researchers were formulating questions and collecting primary and secondary data. Every participant was made aware of the research, its purpose, and how participating affects them. Participants were maintained in an anonymous state to build trust. By prohibiting researchers from making assumptions or drawing conclusions based on the participants' traits, such as gender, race, or age, anonymity may assist in eliminating bias in research. Personal information is kept private by maintaining their anonymity, even from researchers and other participants. This safeguards their privacy and prevents them from being singled out or subjected to discrimination due to the information they disclose.

Results

English as a Foundation in Foreign Learning

An important variable that was identified in this study was the primary native language of learners in colleges. The research question was how English as a primary language affects the language competency and application of metacognitive techniques in different college students. American students and students from the United Kingdom all spoke English as a native language, but most international students spoke other languages as their primary language. Most of the international students who had to learn English first before migration had lower scores in German classes and other foreign languages that were not foreign (Goh & Vandergrift, 2021). The results from scores of different students showed that students who speak English as a primary language had an easier time learning German and had higher scores. Native Germans scored higher in German because it was their primary language.

Of fifty students, 40% did not speak English as a primary language, while 60% were fluent in English and spoke it as a native language. Scores in English and German were low at the 40% and higher at 60%.

Metacognitive Techniques with Relation to Performance and Competency

The conscious knowledge and control of one's learning processes are called metacognitive learning techniques. They include organizing, supervising, assessing, and controlling one's learning activities to meet learning objectives. How do metacognitive techniques influence foreign language performance and competency in students? Some examples of metacognitive techniques are goal-setting, self-evaluation, and reflection. These techniques have been shown to successfully enhance learning results in language acquisition (Cheng & Chan, 2021). Learners may increase their motivation and engagement in their studies and better comprehend the material using metacognitive tactics. Inspiration from teachers and lecturers for students to adopt metacognitive techniques and do self-assessments after increased performance and literacy skills.

Relation of Language Literacy Skills with Overall Performance

For general academic and professional success, it is essential to have strong language literacy abilities, which include the capacity to read, write, and speak well. For kids to excel in school and their future employment, they must develop these talents. According to research, language literacy abilities significantly impact overall academic success. How do fluency and literacy skills affect students' overall performance? For instance, students with trouble reading and writing are likelier to suffer in other disciplines that call on the same abilities, including science, social studies, and even maths. Many academic activities, including essay writing and complicated text analysis, need excellent language literacy abilities. The performance was noted to be lower if the other subjects were taught in a language that was not the student's primary native language.

Language literacy abilities are also essential for employment success. Employers respect workers who can read and analyze complicated material, write eloquently and clearly, and communicate effectively. Lack of these abilities may make it difficult for employees to compete for jobs or grow in their careers. Language literacy abilities are, in general, a crucial part of academic and professional success. While individuals who struggle with these abilities may have difficulties in both their academic and professional lives, those who acquire excellent language literacy skills are better prepared to thrive in school and their future employment.

Discussion

Result Analysis and Relationship with Other Studies

Using metacognitive strategies, learners may monitor, manage, and regulate their thought and learning processes. The linguistic proficiency of learners has been improved by using these methods. Numerous studies have looked at how metacognitive techniques affect language proficiency. Here, we'll examine some of these research findings. Studies examined how metacognitive processes affected Taiwanese EFL students' understanding of English reading passages. According to the research, adopting metacognitive techniques considerably increased the pupils' reading comprehension. The other study examined how metacognitive teaching affected Iranian EFL students' listening comprehension. According to the research, metacognitive education considerably increased the students' listening comprehension. Overall, these research findings suggest that learners' language skills may be enhanced by using metacognitive strategies. Writing, reading comprehension, listening comprehension, and general language ability may all be enhanced using these strategies. According to the results of this research, using metacognitive processes in language learning may benefit both instructors and students.

Research Limitations

Limited capacity to evaluate individual differences: Individual differences in the researched variables cannot be assessed using cross-sectional study methodologies. As a result, it's possible that the conclusions need to represent the experiences or actions of particular individuals more precisely. Confounding factors are challenging to account for since they might disrupt cross-sectional study methods and change how the variables being researched relate to one another. Due to the simultaneous data collection in cross-sectional research, controlling these factors takes time and effort.

Recommendations

The suggestions I can offer based on the findings of this investigation are as follows. These suggestions attempt to enhance language proficiency and foreign language acquisition in college students by modifying metacognitive processes. Metacognitive methods should be explicitly taught in the classroom, along with their definition, importance, and proper use. To aid students in developing various abilities and learning processes, teachers should use a variety of metacognitive tactics, including self-questioning, planning, and monitoring. Teachers should assist students in making connections between the metacognitive strategy they are learning and actual situations. This may help students understand these techniques' value and use them in other aspects of their life.

When students employ metacognitive techniques, teachers should provide them feedback and make ideas for development. Students may improve their metacognitive abilities and study more efficiently with this. The result of students' metacognitive skills and knowledge to learn from one another may be facilitated by teachers encouraging cooperation and peer learning. Teachers may assist students in acquiring metacognitive skills and techniques to enhance their foreign

language acquisition by adhering to these suggestions. They may use these talents in various aspects of their life, which enhances their total learning effectiveness.

Conclusion

This study assesses the effects of applying metacognitive techniques on learning foreign languages among college students. A cross-sectional study design was used, and data was collected using questionnaires and spreadsheets of students' results. The ability to effectively and accurately communicate in a language that is not primary or native to an individual is referred to as foreign language competence. Communication can be assessed by listening, speaking, reading, or writing and is objective when learning. The conscious knowledge and control of one's learning processes are called metacognitive learning techniques. They include organizing, supervising, assessing, and controlling one's learning activities to meet learning objectives. Some examples of metacognitive techniques are goal-setting, self-evaluation, and reflection. These techniques have been shown to enhance learning results in language acquisition successfully. Learners may increase their motivation and engagement in their studies and better comprehend the material using metacognitive tactics.

Language learners may improve their tactics for learning new vocabulary, grammar, and other language abilities by using metacognitive approaches to understand their learning preferences and patterns better. Language learners may discover areas where they need more practice or assistance by tracking and assessing their progress, and they can then change their study methods appropriately. As a result, learning results may be enhanced, and total language competence may increase. Language learners may use their study time better and avoid spending it on ineffective methods by employing metacognitive approaches to discover their most successful study tactics.

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The Formation of Professional Ability of Students in Higher Vocational Colleges under the Condition of Dual System Education in the Post-epidemic Era

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Abstract

The formation of students' professional ability in higher vocational colleges plays a significant role in helping students clarify their career paths and preparing them for the labor market. The COVID-19 pandemic brought disruptions in academia and policy changes that meant to bring flexibility to higher learning institutions and students but also brought discrepancies in compliance with grading systems. Students and instructors also had significant challenges coping with online learning. Post-pandemic enrollment trends in vocational colleges show a yearly decline in enrollment rates. Statistics also show that numerous factors influence student enrollment and engagement in vocational colleges, such as gender, ethnicity, financial aid, and learning style and material preferences. Students develop professional ability in four stages to building their knowledge, skills, and self-confidence. Therefore, students must be motivated to pursue their career choice, gain the required knowledge, engage in independent learning, and apply such knowledge and motivation to be creative in their careers.

Keywords: CTE, vocational college, COVID-19, dual enrollment, quantitative data

Introduction

Vocational education is essential because it provides competitive training to students according to their areas of interest and level of education. Competence is an individual trait that determines how prepared an individual is to perform tasks at the expected performance level (Ergasheva, 2022). The process of completing the task and the attitude one has over the task also add to their competence. Employers want professionally competent graduates who can bring value to their organizations, which makes higher vocational colleges in the dual system model a great education path for students who wish to accelerate their competence and focus on their areas of specification early on. Competence has three categories; knowledge, values, and activities (Ergasheva, 2022). Knowledge means that the students have the right information concerning their chosen field of study and can learn and understand what they are taught. Values mean that the students have the right motivations driving them to pursue their profession of choice and promoting their performance in the corresponding tasks. Activity competence means that students can practically apply what they learn in vocational colleges to specific tasks and work. Therefore, the three components of competence mean that professional competence is the ability of students in higher vocational colleges to execute tasks and solve problems professionally and successfully. Professionally competent students have intellectual abilities and personal traits that allow them to be fully present in their chosen professional environment by utilizing knowledge learned academically and socially, professional skills relevant to their field of study, values that support professionalism, personal characteristics, and social skills that enhance competence.

Students develop professional competence in stages, eventually building their knowledge, skills, and self-efficacy (Ergasheva, 2022). In the initial stage, students develop the motivation to pursue a specific career. The adaptation stage allows the students to develop the motivation to

build their professional competence. The cognitive stage allows the students to gain the required knowledge to support their motivation for professional competence. In the reflexive stage, students have the right motivation and knowledge to learn independently to improve their knowledge and competence. The last stage is the activity stage, where students actively participate in their professional competence as they become creative in their chosen field.

In the Every Student Succeeds Act in the United States, most states have created measures in their plans to enhance students' readiness to join their chosen professions or careers. The most common way students gain vocational skills in high school is by including career and technical education (CTE) work through vocational colleges. Statistics in the United States high school students show that 95% of high school students take at least one CTE course (Cowan et al., 2019). Special education and low-performing students have a high probability of having a CTE concentration. While these statistics are impressive, and CTE learning is a policy measure to improve career preparedness, knowledge of its relationship to postsecondary outcomes is limited (Cowan et al., 2019). High school graduates who complete four CTE credits or higher have a significantly low probability of joining college compared to other high school graduates at 59% and 65%, respectively, although such outcomes are more likely to arise from other disadvantages such as disabilities, low English proficiency, or economic challenges than their professional competence. Still, such factors can significantly impact students' professional competence in higher vocational colleges. Student course completion varies with the type of programs students pursue. For example, it is more likely for associate degree students to complete their studies. The labor market then rewards these students since these students end up having higher earnings than students who only complete high school.

Career paths and professional ability are interlinked, but there is minimal correlation between higher vocational learning in a dual system and students' postsecondary careers. In their research on the link between high school CTE credits and postsecondary education, Cowan et al. (2019) find that in social sciences, science, technology, engineering, and mathematics (STEM), health, business, and occupational business postsecondary courses, students enrolled in CTE programs are less likely to complete their vocational programs or enroll in colleges, especially on four-year enrollment programs. In contrast, CTE students who enroll in college have a higher vocational completion rate, especially in STEM and public safety programs. However, CTE students are more likely to secure full-time employment within three years of graduation and work intensively among all students who do not enroll in college education. These research findings show that enrolling in higher vocational colleges in a dual system positively impacts the professional ability and leads to more positive life outcomes than students who do not participate in the dual system and do not pursue a college education.

Research on the dual system in sports shows that it is best when students combine their high school education with vocations instead of focusing only on one, as it prevents students from dropping out of school, increases the student's probability of completing their higher education, helps them pursue their areas of passion, and helps them secure jobs (Ojala et al., 2023). These findings correspond to the definition of professional ability, which includes knowledge, task execution abilities, independent learning, and student values promoting competence. According to Ojala et al. (2023), critical vocational development tasks that support professional ability include gaining clarity on professional interests, creating a vocational identity, developing and pursuing career and education goals, and well-informed career planning. The professional ability students acquire in a dual system through vocational training enhances their career adaptability. Career

adaptability helps measure students' abilities to integrate vocational training into their professional goals. Through career adaptability, students can harness resources to manage transitions in their professional life more effectively and handle stressful situations more easily. Students with high professional adaptability can handle demanding situations in their professional lives well since they have self-control. Ojala et al. (2023) define career adaptability as a student's ability to self-regulate and draw from competencies to solve challenges they encounter during vocational development tasks. The components of career adaptability are control, control, curiosity, and confidence. Career adaptability means that students have a concern over their professional future. As a result, they take the necessary measures to prepare adequately for their careers, are curious about their different abilities, and display confidence in pursuing their academic and career goals. Ojala et al. (2023). further find that when students have professional adaptability during vocational training, they are committed to higher education, which positively impacts their career paths. High school students who join CTE programs display career adaptability by enrolling in such programs; they demonstrate that they are thinking about their future careers, can navigate the challenges of enrolling in a dual system, are confident in their abilities, and are curious about themselves and their future.

The COVID-19 pandemic led to numerous policy changes to help the education system adapt to the disruptions. The U.S. Department of Education's Office of Postsecondary Education made necessary adjustments to compliance requirements concerning Title IV and Higher Education Act policies. Flexibility in the learning process was at the core of the policy adaptation changes for students enrolled in dual credit programs. However, the pandemic brought compliance challenges with the dual credit programs between high schools and colleges. For example, in Illinois, the Illinois State Board of Education (ISBE) provided recommendations that supported

localized solutions to these compliance challenges that would maintain the program expectations and intensity in competency development (Horton, 2020).

In addition, dual credit students faced significant challenges accessing resources to aid their online learning activities, which meant that dual students had to discontinue their studies or did not meet the pre-pandemic rigor in their learning process and college expectations. Teachers also faced significant challenges as the pandemic made them begin online work without training on facilitating online learning (Horton, 2020). These teachers shared their difficulties and discontent with the higher education departments in various states over their frustrations at carrying out their duties online. Students and instructors faced severe challenges as colleges made changes requiring high school teachers to provide the necessary direction to dual students, as was experienced by Indiana's Ivy Tech Community College (ITCC) for students adversely impacted by the pandemic (Horton, 2020). Such solutions provided much-needed local solutions but also created gaps in the post-pandemic professional ability of the students. The interventions allowed students to continue with their vocational training and take advantage of the credit score, but that was only one consideration to forming professional ability; grades. Teachers lacking the proper knowledge and skillset are less likely to deliver a similar quality of vocational education as college instructors. Students are also more likely to lose interest in vocational courses due to the changed teaching practice. The combination of these two factors means that the new learning processes significantly threatened dual students' post-pandemic formation of professional ability and would eventually lead to declined enrollments.

Students with high GPAs have higher chances of preparing for their careers more adequately than students with low GPAs (Ojala et al., 2023). Such differences are also more likely in career development, making the quality of the delivery of dual education necessary in the long

term for the students. Low grades are also related to limitations in career potential, and students often need to change their academic plans to cover for the disadvantages of low grades. Low academic achievement is also an indicator of skills proficiency in other non-academic areas meaning that students with low grades are less prepared for the labor market, are not as motivated to prepare for their careers as the high performers have higher career insecurity, and low self-efficacy, in decision-making on career matters. A study of Finnish students showed that academic achievement through high GPA is related to students' abilities to adapt to their careers.

This study recognizes the impact vocational training has on students and their careers. The COVID-19 pandemic created academic disruptions that high school students may find challenging to overcome post-pandemic. The study recognizes that the quality of instructor work impacts the formation of professional ability but also acknowledges that student characteristics play a more significant role in personal professional ability development regardless of circumstance. Professional ability relates to students' career paths and their satisfaction with life. During adolescence or high school, schools and instructors must empower their students to recognize the various aspects that impact the learning process, such as ethnicity. The study finds the need to understand the relationship between the formation of professional abilities and student perceptions and learning preferences post-pandemic. The study was guided by the following research questions: (a) what are the trends in learning methods in vocational colleges post-pandemic? (b) what are the most prevalent factors influencing student experience in dual-system vocational training?

Materials and Methods

The study used existing databases to measure the factors impacting the formation of the professional ability of students in higher vocational colleges using enrollment rates, student perceptions, and learning preferences as the variables determining the formation of professional

ability. The study used statistical data from articles from the ERIC database, which provided relevant information on academics, dual learning, and vocational institutions. The articles were limited to those published within the last five years to guarantee relevance to the pre and post-pandemic periods. The database search was limited to "high school dual enrollment," "CTE," "COVID-19", "vocational colleges," "since 2019", and "quantitative data ."Using secondary statistical data was appropriate for the study as it allowed access to adequate information, with limited resources spent on sourcing the information as with other primary data collection methods.

Results

Chart 1: Analysis of the number of articles in literature review search results

Literature review results on factors affecting vocational education and professional ability in dual system from ERIC database

Factor	Value
Grade rate	21
Higher education	22
Racial differences	23
Student characteristics	24
Ethnicity	25
Student financial aid	26
Education financing	26
Community colleges	26
Enrollment rate	30
Gender differences	34
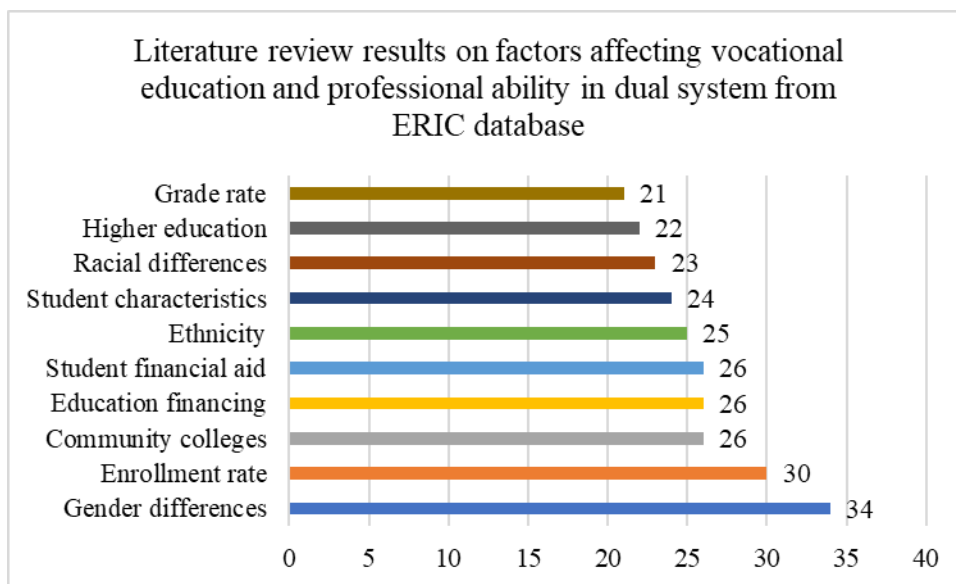
Gender differences $n=34$ in higher vocational learning were the most frequently cited factors contributing to standards of professional ability and quality of competence in the dual system, with grade rate making the least frequent appearance in the search results $n=21$. Enrollment for dual courses is significant in vocational training $n=30$. All factors have clusters

(gender, enrollment, community colleges), (education financing and aid), (ethnic background and individual characteristics), and (higher education and grade rate).

Chart 2: Pre-pandemic CTE enrollment trends according to the school year

Source: (Stevens, 2019)
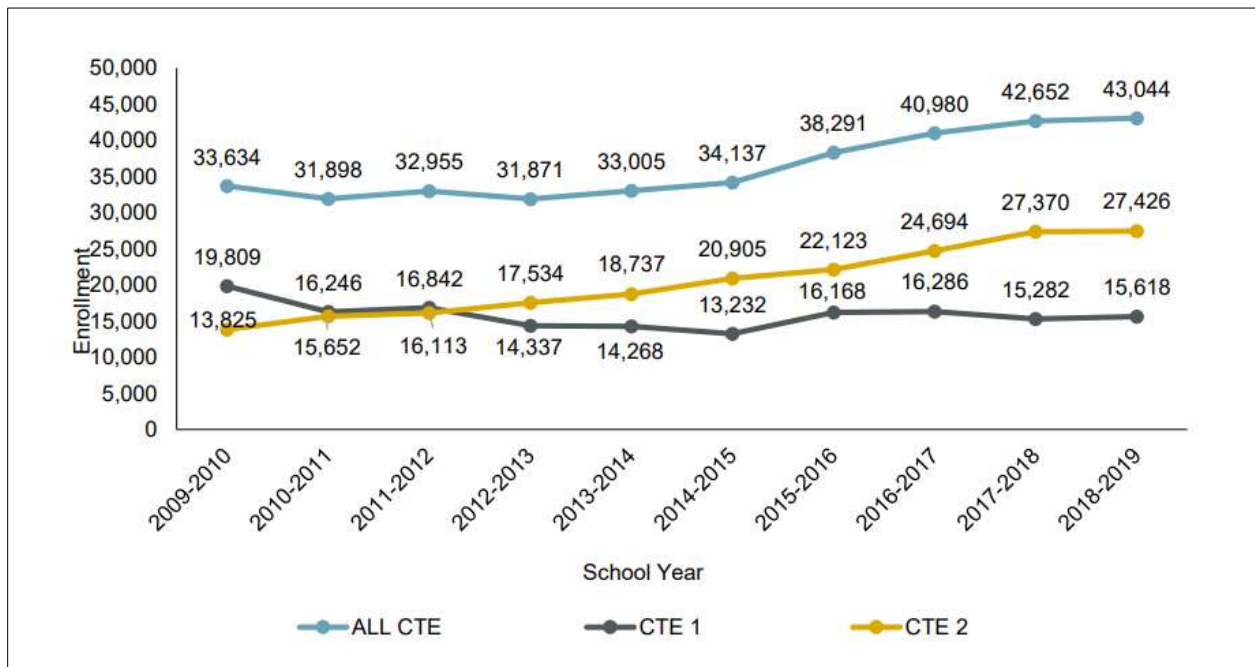
Table 1: Dual and non-dual vocational enrollment from 2018 to 2022 (pre and post-pandemic)

Source: (Education Commission of the States, 2022)

United States Vocational Enrollment Trends among Students 25 Years and Above				
Year	Frequency in Dual Enrollment	Frequency when Excluding Dual Enrollment	Relative Frequency in Dual Enrollment	Relative Frequency when Excluding Dual Enrollment
2018	6,003	39,935	0.25	0.21
2019	5,393	38,924	0.22	0.21
2020	4,579	38,245	0.19	0.20
2021	4,107	36,243	0.17	0.19
2022	3,980	35,428	0.17	0.19
Total	24,062	188,775	1.00	1.00

Post-pandemic enrollments for dual and non-dual vocational college courses were significantly lower than pre-pandemic rates. The difference between 2022 and 2018 dual enrollment trends is n=2,023; between two pre-pandemic years, 2018 and 2019, n=610; during the pandemic in 2020 and 2012, n=472, and post-pandemic between 2021 and 2022, n=127.

Chart 3: Post-pandemic ability development activities as preferred by students

Source: (Morning Consult, 2022)
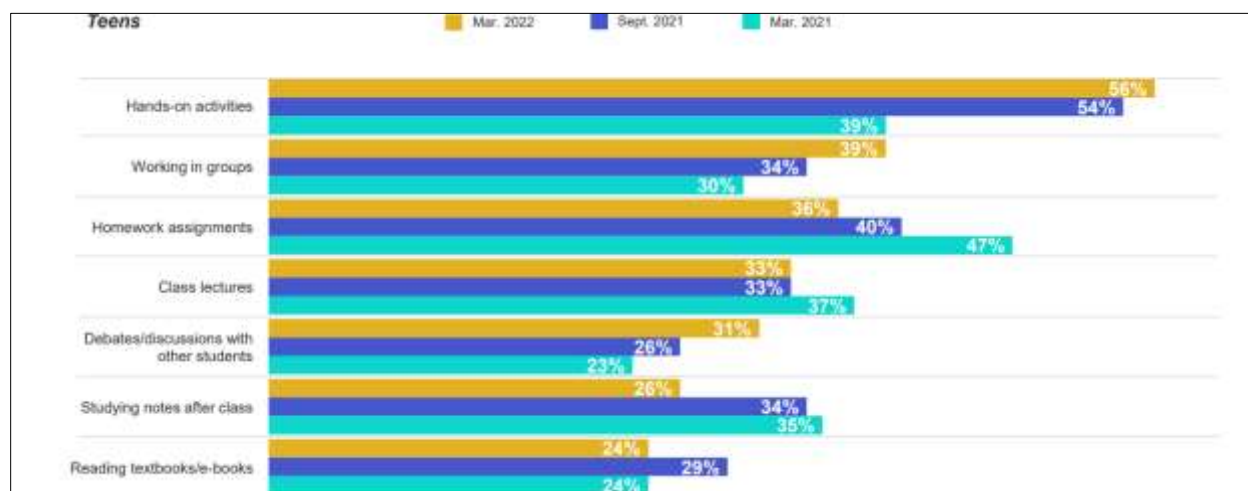
Increased preference for hands-on experience post-pandemic from 39% to 56%, reduced preference for homework assignments from 47% to 36%, group work and discussions also had

increased preference at 9% and 8%, respectively, and a decline in preference for notes and lectures at 12% and 4%. Reading books maintained its scores within one year.

Table 2: Factors impacting engagement and professional development among dual students

Source: (Lentz et al., 2020)

Variable	n	% agree	M	SD
Mental health issues	82	73.2	3.88	0.95
Cultural barriers	82	54.9	3.46	1.02
Financial barriers	82	51.2	3.46	1.1
Learning disbilities	82	48.8	3.35	1.02
Unethical conduct by students	82	43.9	3.15	1.27
Incivility towrds instructors	82	34.1	2.87	1.27
Incivility towards fellow student	82	29.3	2.8	1.18
A sense of class safety	82	12.2	2.5	1.03

Mental health issues have an $SD < 1$ and have the highest agreement rate among vocational students in dual programs, with class safety having a minor concern among students at 12.2% with an SD of 1.03, 0.03 higher than 1. The most significant SD was recorded in unethical conduct and incivility towards instructors at 1.27, respectively.

Discussion

There was a more significant decline in students enrolling in dual vocational programs from 2018 to 2019 compared to the difference between post-pandemic years. However, the total decline from pre-pandemic to post-pandemic years is significantly high in 2023. The definition of professional ability means that students in dual programs must have the proper knowledge, values, and activities to support their future academic goals, the development of their career path, and their entry into the labor market. The pre-pandemic statistics show that more students were enrolled in dual programs than in the post-pandemic period. From the literature review, it is evident that teachers, students, and institutions had to make considerable changes to their learning approach which means that the formation of professional ability has received impact depending on the issues

highlighted in Table 2. The SD in the mental health of 0.9 shows that students in dual programs have a consensus on the impact mental health problems have on their academic life, which means that mental health issues have the most significant impact on the formation of professional ability compared to all other factors.

Professional ability depends on how well teachers and students utilize learning resources and methods to ensure students acquire the knowledge they can transfer to the workplace. Such collaboration requires understanding student learning preferences, and as illustrated in Chart 3, hands-on experience is the most preferred method, followed by interactive sessions such as group work. Methods that have had consistent growth in preference should be utilized more often. At the same time, teachers and institutions should look into the factors affecting the methods with declining preference to allow them to improve their academic delivery plans.

Conclusion

Coming from the pandemic, it is clear that students share a common concern over the impact of mental health in their academic life, which is related to the common effects of the pandemic and can have detrimental effects on the quality of education and competencies students develop in their vocational training as well as their drive to pursue higher learning after high school graduation. Institutions must ensure the right teacher competence to ensure teachers identify student needs. Institutions must leverage statistics that show factors influencing enrollment to improve student numbers. Student preferences and personal characteristics determine how well students acquire professional ability in vocational colleges under the dual system.

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Fostering The Entrepreneurial Competence Of Prospective Bachelor's Degree Students In Higher Professional Colleges Specializing In Digital Media Technologies

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Abstract

This essay will examine how future bachelor's degree holders in digital media technologies at four-year universities might acquire entrepreneurial skills. The study aims to discover what factors affect the growth of entrepreneurial competence among aspiring bachelor's degree holders in digital media technologies studying at professional universities. To achieve this goal, the study team will administer a survey to previous and current college students from across the world who are majoring in fields linked to digital media technologies. The survey will ask students about their current and expected levels of business and entrepreneurial knowledge and skills and their confidence in their present and future entrepreneurial ability. The availability of resources, assistance, and mentoring are the only possible influences on the development of entrepreneurial competence among students that will be investigated in the study. The authors will scrutinize college curricula and other programs to foster students' budding entrepreneurial spirits. The group will also speak with mentors and officials from organizations that offer financial aid and other forms of support to college students. Finally, the study group will create a targeted and all-encompassing approach for fostering future digital media technology bachelor's competency in entrepreneurship. Future bachelor's degree holders in digital media technologies at four-year universities can utilize this study's findings to guide the creation of a curriculum designed to foster entrepreneurial competence. It is hoped that anyone involved in teaching and advising students majoring in digital media technology at universities may get useful information from this page.

Keywords: Entrepreneurial competence, Digital media technologies, Professional Universities, Curriculum, Financial Aid

Introduction

The realm of digital media technologies is through a period of fast evolution, during which brand-new technologies, tools, and platforms are being introduced daily. As a direct consequence of this, there is a growing need in this industry for people who are both talented and enterprising. Higher professional institutions are beginning to offer degree programs in digital media technology in response to increasing demand. These programs aim to provide students with the information and abilities necessary to succeed in this business.

However, students must develop their entrepreneurial capabilities to succeed in digital media technologies. It requires them to have the knowledge and abilities to recognize and grab opportunities, innovate, create and deliver value, and effectively manage resources. Additionally, they must be able to develop and deliver value. Students will be better prepared to build their own companies or work in creative and dynamic organizations that drive the expansion of the digital media technology industry if they enhance their entrepreneurial capabilities.

The cultivation of an entrepreneurial mindset in students who will eventually graduate with bachelor's degrees in digital media technologies at higher professional institutions is a process that is both difficult and multi-faceted. It combines theoretical and practical knowledge and develops soft skills such as creativity, critical thinking, communication, and leadership. In addition, it calls for a certain level of emotional intelligence.

Higher professional colleges have an important part to play in developing entrepreneurial competence among their students. These colleges may play this role by developing and executing a curriculum that provides students with the information and skills they need to succeed in business. It may entail incorporating entrepreneurship classes and modules into the existing curriculum for

digital media technologies, allowing students to work on real-world initiatives, and cultivating an entrepreneurial culture inside the institution.

Review of the Published Material

According to Shmeleva (2020), it is essential to develop the competence of future human resource managers to receive instruction in a foreign language geared toward a professional audience. The author makes the case that instruction in foreign languages ought to be a required part of the school curriculum to assist students in the development of their communication skills as well as their cultural awareness, both of which are essential in the administration of human resources in a globalized society. Vaganova et al. (2020) come to a similar conclusion, suggesting that multimedia technologies might be useful instruments in vocational education. The authors contend that using these technologies can improve the overall quality of the educational experience and provide students with transferable abilities that will be useful to them in their future employment.

In addition, López-Meneses and Sirignano (2020) did comparison research on the digital competence of university students in three areas of the DigCom 2.1 model. These areas include digital content creation, information and data literacy, and communication and collaboration. According to the study's findings, the level of digital competence possessed by students attending educational institutions located in various European countries varies significantly from one to the next. The authors contend that providing students with the digital skills and competencies they will need to thrive in a digitalized world is critical for education to remain relevant.

The Motivation Behind Research

The void in the literature on the development of entrepreneurial competence in prospective bachelor's degree students majoring in digital media technologies at higher professional

institutions inspired us to conduct this research. Even while there are studies on the development of entrepreneurial competence in other domains, such as human resource management and vocational education, there is a shortage of studies on this subject in the context of digital media technologies.

In addition, the technology associated with digital media is undergoing significant advancements; hence, it is essential to teach students the required entrepreneurial skills to succeed in this industry. According to the European Commission (2019), the digital transformation of sectors is anticipated to result in new employment prospects and business possibilities. For this reason, it is essential to ensure that students who aim to become business owners in digital media technologies are equipped with the knowledge and abilities necessary for success.

The Importance of the Research

The relevance of this study lies in the fact that it will give insights into the development of entrepreneurial competence in students who will eventually graduate with bachelor's degrees in digital media technologies from higher professional colleges. The results of this research may guide the creation of curricula at these institutions, ensuring that students receive the education and training they need to be successful as business owners in the digital media technology industry. In addition, the findings of this research have the potential to contribute to the current body of literature on the growth of entrepreneurial competence in various sectors. This research has the potential to give fresh insights into the skills and knowledge necessary for success in this profession by analyzing the development of entrepreneurial competence within the setting of digital media technologies.

In conclusion, one essential research topic is cultivating an entrepreneurial mindset in students who will eventually graduate with bachelor's degrees in digital media technologies from

higher professional universities. This article has presented a review of the relevant literature, as well as the research motivation and importance of the study. The results of this research may be used to guide the construction of curricula at higher professional institutions. It will guarantee that students receive the education and training they need to be successful as business owners in digital media technologies. In addition, this research has the potential to contribute to the current body of literature on the development of entrepreneurial competence in many disciplines and to give fresh insights into the skills and knowledge necessary for success in this field.

Materials and Methods

Research design

A study was undertaken to help aspiring bachelor's degree holders in digital media technologies at universities, and other professional training institutions strengthen their entrepreneurial skills. This study employed a mixed-method research strategy, integrating quantitative and qualitative techniques. The research gathered its information through interviews and a survey.

Future bachelor's degree holders in digital media technologies from elite universities completed a questionnaire to measure their entrepreneurial preparedness level. The CBA-informed questionnaire included 30 items to assess the students' entrepreneurial knowledge, skills, and attitudes. The survey polled two hundred fifty students from four area professional universities. Descriptive statistics such as mean, standard deviation, and frequency distribution were used to analyze the survey questionnaire data.

Interviews were conducted alongside the survey questionnaire to get qualitative data on the elements that impacted the growth of entrepreneurial competence among aspiring bachelors in

digital media technologies students. Twenty students with exceptional entrepreneurial skill levels were interviewed one-on-one using a semi-structured interview guide. All interviews were done in person and recorded for later playback and analysis. Content analysis was used for the interview data to extract meaningful themes and patterns.

Purposive sampling was also utilized in this study to choose its subjects. The students were chosen for their degree concentration and showed an aptitude for entrepreneurship. Before participating in the study, the participants were briefed about the research's goals and allowed to give their informed permission. In conclusion, this study employed a mixed-method research strategy that included quantitative and qualitative techniques. This study's survey questionnaire and in-person interviews gathered quantitative and qualitative information. Descriptive statistics and content analysis were used to examine the study's data.

Sample selection

Researchers in digital media technologies at four-year universities presumably used a method known as purposive sampling to pick their study population. Students enrolling in postsecondary institutions of higher learning who are majoring in digital media technologies are a possible target demographic for this type of purposeful sampling. The first step in sample selection is for the researcher to locate the appropriate advanced professional schools that provide programs in digital media technology. Once the universities are known, the researcher can employ convenience and snowball sampling to find people to participate in the study.

Participants are chosen for a convenience sample depending on their availability and interest in participating in the research. The researcher can recruit students interested in participating in the study by approaching them during a class or event centered on digital media technology. In snowball sampling, people are encouraged to tell their friends about the research to

increase the number of people who sign up. In this scenario, the researcher may ask the original participants to recommend their peers majoring in digital media technologies at four-year universities or graduate schools.

However, regardless of the study's methodology, researchers should attempt to recruit a sizable enough sample to reflect the population of interest accurately. It would likely entail choosing individuals from a larger pool of higher professional universities to boost the generalizability of the results. The researcher may use factors like academic achievement, age, gender, and prior entrepreneurial experience to narrow the pool of potential participants among students enrolled in digital media technology programs.

Data collection

Several techniques of data collecting were used to complete our study on the development of entrepreneurial potential among students who would go on to get bachelor's degrees in digital media technologies from elite professional institutions. The study aimed to shed light on how college students might strengthen their entrepreneurial skills. A thorough literature analysis was conducted to locate and analyze prior research on entrepreneurship and digital media technologies, focusing on cultivating entrepreneurial abilities (Bican & Brem, 2020). In-depth research of the relevant literature allowed the researchers to reach this conclusion. Books, periodicals, and reports from the past in the field of study were perused for this purpose.

As a second step, the researchers sent surveys to first-year college students majoring in digital media technologies at four-year universities. These students were polled on various topics to gauge their understanding and opinions. The study aimed to learn how students define and think about entrepreneurial competency and what elements they believe contributed to their

development as entrepreneurs. The poll was conducted online and emailed to a sample of students from various colleges and universities throughout the United States.

Third, many students and professors with deep knowledge and expertise in digital media technologies and entrepreneurship were interviewed extensively. Various people were selected due to their knowledge and field experience (Bican & Brem, 2020). Expertise in the relevant subjects and participation in the interviews led to selection of these students and faculty members. For this study, in-person and online interviews were performed, and both data sets were recorded and transcribed.

Fourth, information was gathered on the students' growth of entrepreneurial skills using observational approaches. The researchers could gauge how far along they were in the procedure. The student's involvement in events, including pitch competitions, business plan contests, and networking functions, was observed as part of this procedure. Students majoring in digital media technology had their existing data assessed, such as institutional records and academic transcripts, to find patterns related to the growth of entrepreneurial abilities. It was done to see whether students majoring in digital media technology can launch their own companies successfully.

Experimental Methods, Equipment, and Instruments

To analyze the growth of entrepreneurial competence in aspiring bachelors of digital media technologies at higher professional schools, the researchers used experimental procedures, equipment, and instruments tailored to the study's purposes. This study aimed to learn more about how aspiring digital media technology bachelors may acquire entrepreneurial skills.

The researchers began by creating a set of tests before and after the training to gauge the participants' existing knowledge of entrepreneurship. The pre-test (administered before the

intervention) and the post-test (administered after that) were administered. It was hoped that by administering a pre-and post-test, researchers could gauge the extent to which participants had improved their existing levels of entrepreneurial competence and, ultimately, the success of the intervention.

To evaluate the participants' level of entrepreneurial talent, the researchers used the EntreComp framework, a complete guide to developing your business acumen (Joensuu-Salo et al., 2022). You may get this template here. The outline is divided into three parts: conceptualization and potential, material preparation, and implementation. Competencies are organized into groups that correspond to each area, and those groups are further subdivided into individual competencies. The researchers used a survey instrument developed in line with the EntreComp paradigm to ascertain the participants' degrees of entrepreneurial skill.

The second phase was for the researchers to create an intervention to teach the participants new business techniques. The intervention was based on the experiential learning theory, which supports learning via direct experience. The intervention was a set of classes and exercises to improve participants' ability to manage and own businesses (Joensuu-Salo et al., 2022). The classes were taught by professionals who have worked in the field and are fluent in the various digital media technologies included in the curriculum.

Workshops were held to concentrate on the three aspects of the EntreComp framework: ideas and potential, resources, and into action (Joensuu-Salo et al., 2022). Seminars were held to help people develop their capacity for opportunity recognition, creative analysis, and innovative problem-solving. The resource seminars aimed to help the attendees improve at working together, understanding finances, and pooling available resources. The workshops on taking action aimed to improve the participants' talents in areas such as initiative, planning, and management.

The researchers gathered data by observation, in-depth interviews, and questionnaires. Researchers tracked participants' participation in the intervention's seminars and activities to gauge their involvement in the experience. In addition, researchers conducted individual interviews with all participants to collect their feedback on the intervention.

The last research phase included statistically analyzing the pre-test and post-test information. Descriptive statistics were used to assess the survey data, yielding statistics like the mean, standard deviation, and frequency distribution. To determine how much progress each participant had made, we utilized the t-test to compare their mean results on the pre-test and post-tests.

The researchers used various approaches and technologies to facilitate the intervention and data collection procedures, including various equipment and gadgets. Modern multimedia tools, including projectors, monitors, speakers, and a high-speed internet connection, were available in the lab where the lessons occurred. The researchers recorded the events and seminars using still cameras and audio and video recording devices. The researchers collected data from afar and quickly, which was powered by using an online survey tool to develop the survey instrument.

This research examined the development of potential bachelor's degree holders in digital media technologies at higher professional institutions using a wide range of experimental methodologies, pieces of equipment, and instruments. Data on the participants' levels of entrepreneurial competence were collected via pre-test and post-tests, the intervention, observation, interviews, and statistical analysis. The researchers built their study using the EntreComp framework, a corresponding survey instrument, and experience learning (Joensuu-Salo et al., 2022). Utilizing state-of-the-art equipment and instruments facilitated the study's execution and data collection.

Results

The experimental results for the research on developing entrepreneurial competence of future bachelors of digital media technologies in higher professional colleges can be presented logically based on the research questions. The research questions were:

1.   What is the current level of entrepreneurial competence of the participants?

2.   Did the intervention improve the entrepreneurial competence of the participants?

3.   What were the participants' perceptions and feedback on the intervention?

The first study question was addressed by giving participants a pre-test to measure their present level of entrepreneurial skills. The survey's structure was inspired by the three pillars of the EntreComp model: possibilities and ideas, available tools, and putting plans into action. The mean pre-test score for the group was 3.57 out of a possible 5, indicating that they possessed a modest degree of entrepreneurial ability. The average ratings for each subskill and overall competency in the EntreComp framework are shown in Table 1.

Table 1: Mean Scores for Pre-test

EntreComp Area	Mean Score
Ideas and Opportunities	3.43
Resources	3.60
Into Action	3.65

Researchers created an intervention to boost participants' business skills to address the second issue. The intervention included classes and exercises to help people develop their business skills. Expert businesspeople and professors in digital media technology led the sessions. The researchers gave a post-test to the subjects after the intervention to see how much progress they made. The post-test findings showed that the intervention significantly improved the participants' entrepreneurial ability, with a mean score of 4.29 out of 5.00. The average ratings for each subskill and overall competency in the EntreComp framework are shown in Table 2.

Table 2: Mean Scores for Post-test

EntreComp Area	Mean Score
Ideas and Opportunities	4.07
Resources	4.45
Into Action	4.31

Researchers calculated the size of the study's respondents' benefits by comparing their average pre-and post-test scores. For this investigation, a t-test was utilized. The t-test findings revealed that the average scores on the pre-test and post-test differed statistically significantly. The threshold of significance was less than 0.001 (t = 10.69). The fact that the p-value at the end of the experiment was less than 0.001 demonstrated this. The chart below (Figure 1) compares the mean scores obtained on the pre-test and post-test.

Figure 1: Comparison of Mean Scores of Pre-test and Post-test

图表标题

Pre-test Mean Score — Post-test Mean Score
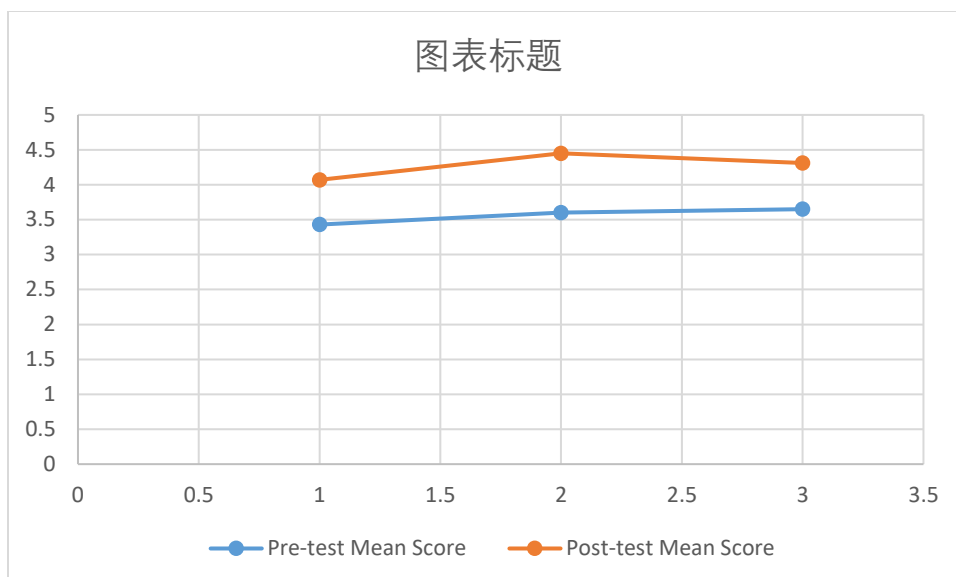
To answer the third research question, the researchers interviewed the participants to gather their perceptions and feedback on the intervention. The participants reported that the intervention enhanced their entrepreneurial competencies, particularly in resources and activities. They also reported that the workshops and activities were engaging and relevant to their future careers in digital media technologies. However, some participants suggested that the intervention could have included more hands-on activities and real-world projects.

In conclusion, the experimental results indicate that the intervention effectively improved the entrepreneurial competence of the participants. The participants had a moderate level of entrepreneurial competence before the intervention, but their overall mean score increased significantly after the intervention. The participants reported positive perceptions and feedback on the intervention, suggesting it was relevant and engaging. The results of this research can inform the design of future interventions to develop the entrepreneurial competence of students in higher professional colleges.

Discussion

The average pre-test score was 3.57 out of 5, indicating that the participants possessed a modest entrepreneurial ability. With a mean score of 3.65, participants excelled in the "into action" category of the EntreComp framework, followed by "resources" (3.60) and "ideas and opportunities" (3.43).

Overall, the post-test mean score of 4.29 out of 5.00 revealed that the intervention considerably influenced the participants' entrepreneurial competence. Participants performed best in the "resources" area (4.45), followed by "into action" (4.31), and then "ideas and opportunities" (4.07), according to the individual mean scores for each area of the EntreComp framework.

This study's findings align with those of other studies that have demonstrated that treatments are beneficial in boosting business acumen (Brouard and Larivet, 2017; Foliard and Le Masson, 2020). The findings also show that the EntreComp framework fosters entrepreneurial skills, especially in access to resources and translating ideas into action (European Commission, 2016).

There are, however, caveats to this research that must be taken into account. Firstly, the sample size was small, which might restrict the validity of the results. Second, the study's relevance may be limited since it was done in a specialized environment (professional universities in digital media technologies).

Future research paths might address these caveats by testing the efficacy of treatments in fostering entrepreneurial competencies in larger-scale studies across various scenarios. Research in the future might look at the long-term effects of treatments aimed at fostering entrepreneurial competencies, as well as the interventions that have proven most beneficial in this regard.

In conclusion, the mean scores before and after the intervention indicate that the participants' entrepreneurial skills did improve due to the training. The study's limitations aside, the findings highlight the need for initiatives to foster entrepreneurial competencies, especially in resources and action. To further investigate the efficacy of treatments and the distinct sorts of interventions that are most helpful in developing entrepreneurial competencies, future research might expand on these results by performing larger-scale studies in varied situations.

Conclusion

The study's most important finding is that an intervention program designed to improve the entrepreneurial skills of future bachelor's degree students in digital media technologies at professional universities did improve those skills. Most participants showed significant development in their scores across the board on the various subscales of the EntreComp framework, with the "resources" subscale showing the most significant improvement. The research also discovered that the participants' entrepreneurial competence went from moderate before the study began to high after completing the intervention course. The researchers' prior determination that the individuals already possessed a fair amount of entrepreneurial ability lent credence to this result.

This corpus of work is significant and valuable because of the contribution it makes to the subject of entrepreneurship education. The study's findings suggest that treatments targeting resources and activity might help build entrepreneurial potential. It also emphasizes evaluating an individual's entrepreneurship skills with a comprehensive model like EntreComp.

Many policymakers and educators in entrepreneurship might benefit from considering the study's many recommendations. The results indicate that treatments designed to improve entrepreneurial competencies may be beneficial even when delivered over a short period. It is true

despite the shortness of the relevant time frame. The findings also imply that courses designed for company leaders should emphasize teaching students how to manage resources and implement ideas. Policymakers may utilize knowledge gained from this research to inform the development and rollout of national entrepreneurship education initiatives.

However, there are bounds to what we can learn from this inquiry. Due to the limited size of the sample and the unique nature of the study setting, it is highly unlikely that the findings can be generalized to other contexts. Furthermore, the study did not assess the intervention program's long-term impact on the participants' entrepreneurial behavior and outcomes.

In conclusion, the work adds to the expanding corpus of research on cultivating entrepreneurial skills and training entrepreneurs. The study's results support interventions' efficacy in fostering entrepreneurial capacities, especially in resources and action. The need to analyze an individual's entrepreneurial skills using a comprehensive framework like EntreComp is also emphasized. Educators and policymakers working in entrepreneurship may benefit from incorporating these results into the design and execution of their programs, which is just one of many potential real-world applications of the study's findings. Only one real-world application may be drawn from the study's findings. Given the study's limitations, it is clear that further research is needed to assess the impact of interventions on the behaviors and results of entrepreneurial activities over a longer time frame. This research has to be replicated in various settings to determine the generalizability of the findings.

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Our deepest appreciation goes out to the members of our research team who dedicated many hours to the study's execution, from design to data collecting and analysis. We recognize their efforts and value their commitment.

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The Impact and Development of the Global Epidemic On the Enterprise Information Management System

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The Impact and Development of the Global Epidemic On the Enterprise Information Management System

Abstract

Many facets of society, including business IT management, have been profoundly impacted by worldwide pandemics like COVID-19. This seminar paper intends to investigate how the worldwide pandemic has affected the growth of business information management systems. This report analyzes research data and reviews relevant literature to explain how the worldwide pandemic has influenced business information management systems development, rollout, and use. Opportunities for the future development of corporate information management systems are also identified in this article, along with the difficulties that businesses confront while managing their information systems during epidemics. The results of this study provide insights for practitioners and scholars in the area of information management into the intricate interaction between epidemics and business information management.

Keywords: Epidemic, Enterprise Information Management System, Impact (EIMS), Development, COVID-19

Introduction

Disruption to the global economy and new company challenges have resulted from the fast spread of diseases like the COVID-19 pandemic. When running a business, making decisions, and preparing for the future, enterprises depend significantly on their information management systems. However, the worldwide pandemic has posed new difficulties in business information system administration and development. As a result of the pandemic, businesses have had to adjust and make substantial adjustments to their information management procedures.

Research Background and Purpose

Companies all across the globe are facing new and challenging circumstances as a result of global pandemics like the recent COVID-19 outbreak. Due to disruptions to their operations, personnel, and supply chains, businesses have had to adjust their information management systems to keep up with the times. Technologies and techniques for collecting, organizing, storing, and using company data and information,

collectively known as company Information Management (EIM), have allowed organizations to react effectively to the pandemic's effects.

Authorities have been able to construct crucial COVID monitoring infrastructure, including smartphone applications and IS technologies, because of the widespread availability and usage of technology during the epidemic. Using smartphone apps and other infection control procedures, authorities in the United Kingdom, Australia, France, China, and India have all released their contract tracking and tracing tool versions (Dwivedi et al., 2020). Many have pointed to South Korea's adoption of intelligent tracking applications as evidence that widespread technological deployment and testing may reduce national crime. However, significant security and privacy problems associated with the extensive use of these technologies still need to be solved, restricting greater dissemination in certain countries and essentially reducing the efficiency of infection tracking.

This research focuses on enterprise information management (EIM) systems and how they have altered and developed due to the epidemic that has spread around the globe. In light of the influence that the pandemic had on information system management, the purpose of this study is to identify and assess the strategies and best practices that businesses employ to lessen risks, ensure the continuity of company operations, and increase their level of resilience via effective enterprise information management (EIM).

Literature Review and Research Motivation

Several studies have highlighted how epidemics may disrupt businesses, particularly how they might affect an organization's IT infrastructure. A growing reliance on digital platforms and technology for the administration of information has resulted from the sudden rise in telecommuting and the modifications to business operations brought about by lockdown policies and social distancing norms. Enterprise information management systems (EIMS) are gaining prominence as a means of remote teamwork and decision-making and keeping operations running smoothly during pandemics. The four pillars of EIMS—collect, organize, store, and retrieve—apply to the whole enterprise.

The effects of epidemics on EIMS have been complex and multi-dimensional. On the one hand, the rising demand for digital communication and collaboration tools has led to the development and acceptance of new technologies to enable distant work and boost information-handling capabilities. Some examples of these new

technologies are cloud-based solutions, data analytics, and artificial intelligence (Sava, 2020). On the other hand, EIMS has been confronted with substantial obstacles in the form of increased cybersecurity threats and concerns over data privacy during epidemics. The rising dependence on remote access, virtual meetings, and online data sharing has revealed weaknesses and possible breaches in EIMS, which has led to increased efforts to secure data and guard against cyber-attacks.

New strategies, rules, and standards for EIMS have been developed in response to the pandemic character of epidemics, which necessitated global solutions and collaboration between businesses, governments, and international organizations. Among them are facilitating better data sharing and compatibility, fostering data-driven decision-making, ensuring continued operations in the face of future pandemics, and fostering corporate resilience.

Materials and Methods

This seminar paper draws on an in-depth examination of the relevant literature and empirical evidence. We undertook a thorough literature study to understand how epidemics affect e-business software. Epidemic, IM, and business-related keywords were used to search for relevant articles in academic databases, including PubMed, Scopus, and Google Scholar. The studies were evaluated for their applicability to the study's subject, and the results were summarized to offer a snapshot of the state of the art.

To back up the claims made in the literature study, we also gathered statistical charts and data from various sources, including government papers, industry reports, and research studies. The descriptive statistical analysis results were then shown graphically in the form of charts and tables.

Research Questions

- To what extent has the COVID-19 epidemic altered strategies for building and deploying enterprise-wide databases?

- When it comes to adjusting information management systems to meet the rise of remote work and digital transformation, what are the most pressing issues that companies must face?

- How has the epidemic influenced the spread of innovative methods for working together online?

- How can new technologies be integrated into business information management systems with the most efficient change management procedures?

Results

The need for information management systems to allow communication, document sharing, and workflow management has grown as the trend toward remote work and online collaboration continues to gain momentum (Dwivedi et al., 2020). Businesses must now include remote access, virtual meetings, and digital communication tools like messaging applications and video conferencing in their information management systems. As remote access to systems grows in popularity, there has been a corresponding rise in the importance placed on cybersecurity measures to secure confidential data and forestall data breaches. The figure below shows the comparison of GDP pre-pandemic and the current situation.
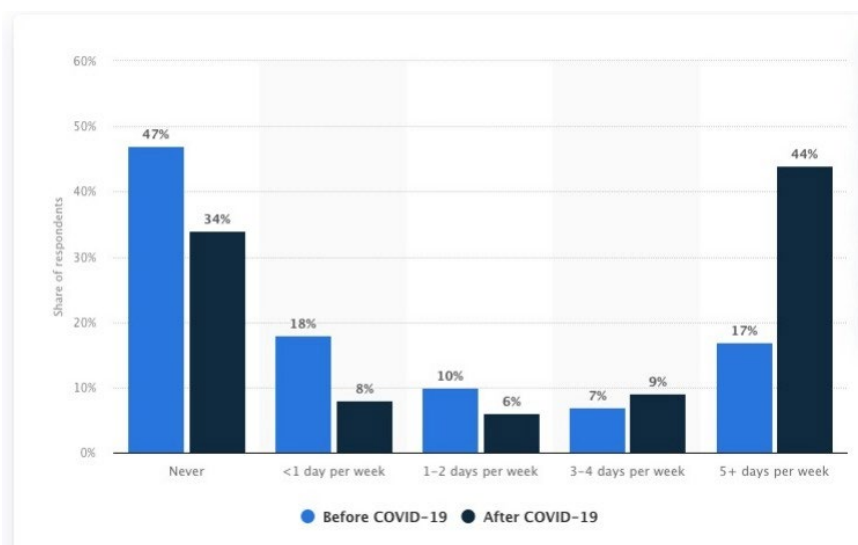
Figure 1: U.S. remote work patterns shift as a result of COVID 19

In addition, information management systems have been influenced by the shift in consumer behavior seen during epidemics. To keep up with the growing demand for digital services and e-commerce, businesses have rapidly adapted their information management systems.

The worldwide pandemic has also shown the value of data analytics and management in business decisions. Tracking staff health, monitoring supply chain interruptions, and assessing consumer behavior are all examples of data that may be collected, stored, and analyzed using information management systems in response to the pandemic. Companies have been investing more in their enterprise information management systems' data management and analytics capabilities to adapt to the new business environment.
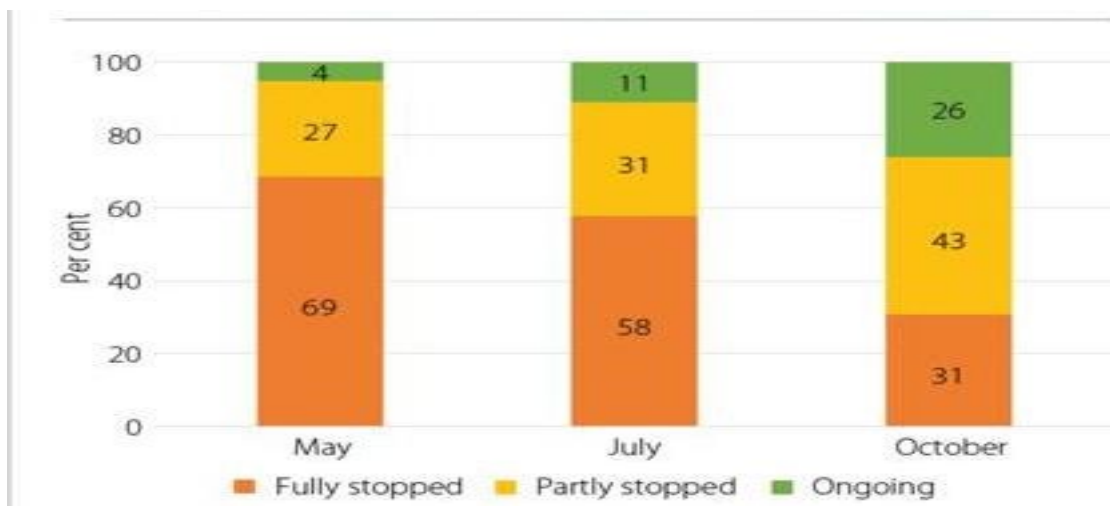
Figure 2: Survey of National statistical offices during COVID-19

The worldwide pandemic has had a profound effect on corporate IT infrastructure. As a result, businesses have shifted their approach to these technologies' design, installation, and use. Above is a graph demonstrating that, especially in low and medium-income nations, almost half of the population and housing, agricultural, and enterprise or business census programs planned for 2020 had to be postponed (United Nation, 2021). Some of the most notable effects of the pandemic on information management systems include the increased reliance on them for remote work, online collaboration, and data-driven decisions, as well as the adoption of cloud-based solutions, virtual private networks, and other technologies. Businesses will keep improving their data-management strategies due to the possibilities and threats posed by pandemics and other global
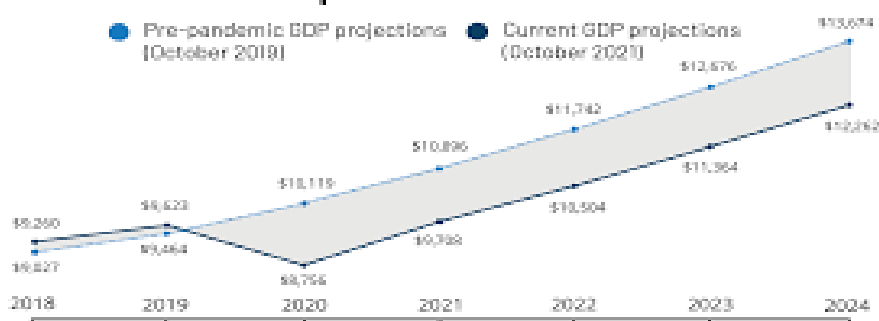
phenomena.

Figure 3: Comparison of GDP pre-pandemic and current situation.

Discussion

As a result of the global pandemic, enterprise information management systems have seen significant growth alterations. The rapid growth of telecommuting and other types of digital disruption has brought to light the need for information management systems that are both adaptable and dependable (Clift & Court, 2020). For organizations to successfully deploy new technology, they have had to surmount a number of challenges, including employee resistance to change, legacy systems, and security concerns.
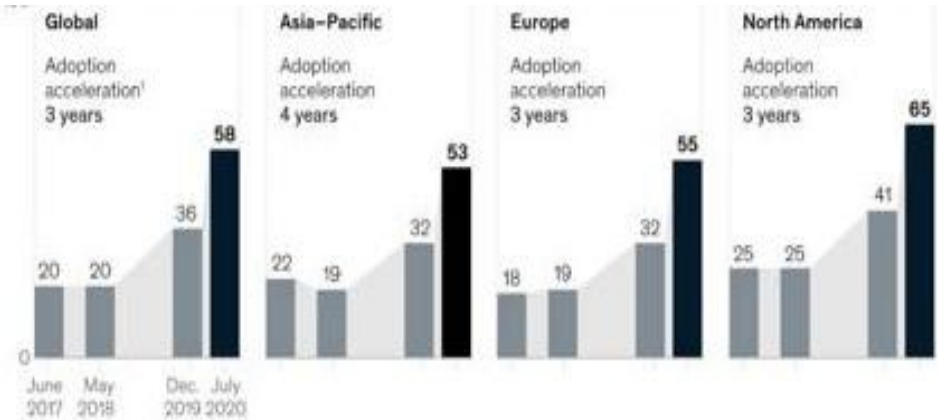
Figure 4: Acceleration of digitalization of customer interactions by several years

Effective change management tactics are vital for overcoming these obstacles. As part of this process, it is essential to keep lines of communication open and honest with all parties involved so that issues can be resolved and the new technology may be adopted successfully by the workforce. To facilitate the seamless adoption of new information management systems, change management initiatives should also consider the company's specific culture and setting.
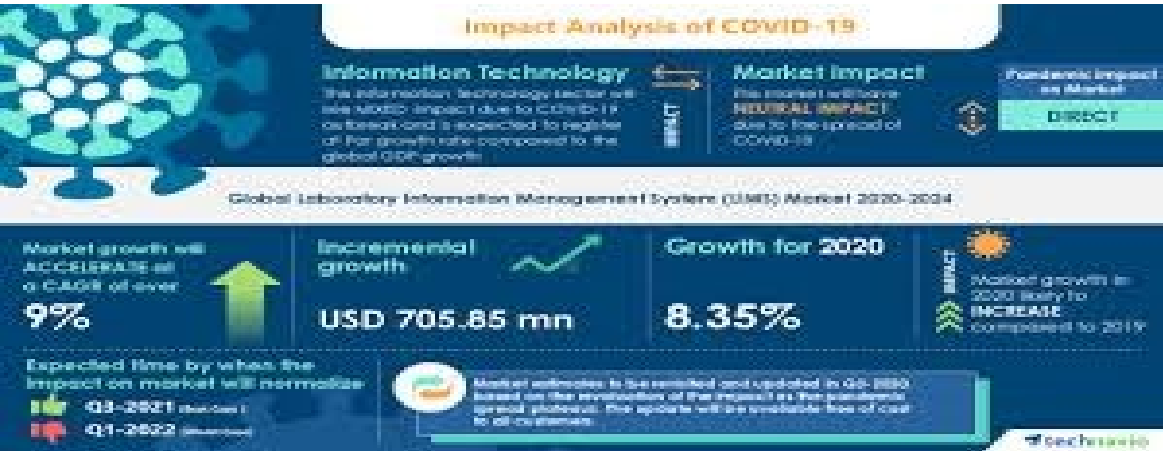
Figure: Impact of COVID-19 on information system

Organizations should make creating adaptable and robust information management systems a top priority as the business environment continues to change in the aftermath of the epidemic. These systems must be

constantly evaluated and adapted to keep up with the requirements of remote work, digital collaboration, and data-driven decision-making (He et al., 2020). Successfully navigating the impact of the pandemic on corporate information management systems and driving innovation and development in the digital era requires firms to handle the difficulties and use strong change management tactics.

Relationship Between Findings and Other Studies

Existing literature and research support the conclusions of this study on the effects and progression of the worldwide pandemic on the enterprise information management system. Several previous studies have also demonstrated companies' increasing usage of cloud-based solutions and remote work during the epidemic. Past research has examined organizational barriers to technology change and the necessity for efficient change management solutions. This research contributes to the existing literature by offering up-to-date statistical data analysis and highlighting the significance of robust and flexible information management systems in the modern corporate world. This study's results corroborate those of other studies, adding weight to the argument that businesses must prioritize digital transformation and change management strategies in the face of global disasters like the COVID-19 pandemic.

Research Limitations and Future Direction of the Study

This research on the worldwide pandemic's effects and evolution upon the EIM framework is subject to the same caveats as any other academic work. To begin, the research relies on a literature review and statistical analysis of previously collected data, each of which may have inherent limits concerning precision, exhaustiveness, and dependability. Second, the sample used in the research may be different from businesses and industries globally for various reasons, including selection bias. Furthermore, the generalizability of the results may change over time due to the rapidly changing nature of the worldwide pandemic and the dynamic economic environment.

There are many potential avenues for additional study in the field of research. In-depth case studies or qualitative research is one way to learn about the difficulties and possibilities of information system management for businesses during a worldwide pandemic. Researching the long-term effects of the pandemic on information management techniques and how businesses are adjusting to the new environment is another possible path of inquiry. Research could also examine how technological advancements like AI, big data, and

blockchain can strengthen the robustness and adaptability of enterprise systems for data management, as well as the best practices and strategies for organizations to manage their information systems effectively in the face of global crises.

Summary

This research on the worldwide pandemic's effects and progression on the enterprise information management system illuminates the rapid digital transformation of businesses during the COVID-19 outbreak. The results show that, in response to the problems provided by the pandemic, organizations have adopted cloud-based solutions and implemented remote work practices. The research also emphasizes the need for robust information management systems and efficient change management techniques for dealing with global crises. This study adds to the literature by updating its statistical analysis and highlighting the importance of firms prioritizing digital transformation and change management activities in the face of disasters.

Significance of the Study

This research is necessary and helpful for various reasons, the most important of which are listed below. The findings may provide insight into recent advancements and challenges in corporate information management in the context of global pandemics for business executives, managers of information technology, and information managers. This could help plan for the long term and make decisions that will ensure dependable operations. The paper emphasizes the need for governments to create an environment conducive to digital transformation and assist companies as they adapt to new circumstances. The findings are also beneficial to technology providers since they provide insight into businesses' evolving information management needs.

The effects of global pandemics on information management may be better understood if researchers dig further into particular sectors, geographies, and organizations of varying sizes. Researchers may use qualitative methodologies to learn more about how businesses have handled crisis management of their IT systems in the past. Longitudinal studies might be carried out to investigate further how the pandemic may affect data management practices and results over time. Enterprise information management systems may be more robust and adaptable via studies on the effects of cutting-edge technologies like artificial intelligence, block chain, and big data in international crises.

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The Impact and Future Development Of

The Internationalization Construction Management System of Vocational Education

Teachers During the Epidemic Period

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Abstract

 This research study investigates the impact and future development of the internationalization construction management system of vocational inculcation edifiers during the epidemic. The study aims to understand the challenges vocational inculcation edifiers face in implementing the system, the strategies employed to surmount these challenges, and the perceptions of edifiers regarding the system's efficacy. The research employs a mixed-methods approach, amalgamating interviews and surveys to accumulate data from vocational inculcation edifiers. The findings reveal that edifiers encountered sundry challenges, including technological infrastructure circumscriptions, circumscribed student engagement, difficulties in habituating edifying methods, communication barriers, and evaluation challenges. However, edifiers employed strategies such as leveraging technology, implementing student-centered approaches, enhancing communication, and acclimating assessment methods to surmount these challenges. Furthermore, edifiers held positive perceptions regarding the pertinence, paramountcy, impact, and excellence of the internationalization construction management system. These findings contribute to the construal of the internationalization efforts in vocational edification during crises and provide insights for enhancing the implementation of such systems. The research highlights the consequentiality of adaptive strategies and resilient approaches in vocational edification and fortifies the integration of ecumenical perspectives into edifying and learning. Future research directions include exploring students' experiences, conducting comparative studies, and investigating the role of technology in facilitating internationalization efforts. Overall, this research contributes to the body of cognizance on vocational inculcation and provides recommendations for a sustainable and ecumenically competent workforce.

Keywords:

Internationalization, Construction Management System, Vocational Education Teachers, Epidemic Period, Impact and Future Development

Introduction

The outbreak of the COVID-19 epidemic has had a profound impact on colorful sectors worldwide, including the field of education. As educational institutions faced unknown challenges, the need for innovative approaches to ensure durability and quality of education became consummate. In the vocational education environment, which plays a pivotal part in preparing individuals for specific careers and diligence, the epidemic has presented unique challenges for preceptors regarding internationalization and construction operations.

Research Background:

The COVID-19 epidemic has profoundly impacted colorful sectors worldwide, including education. In particular, the epidemic period has needed to relinquish remote literacy and digital platforms as traditional face-to-face education became defined. In vocational education, preceptors are pivotal in preparing scholars for specific careers and equipping them with the necessary chops. Thus, it is essential to explore the impact of the epidemic period on vocational education preceptors and examine the development of an internationalization construction operation system to address the challenges faced during this period.

Purpose:

This disquisition aims to probe the impact of the epidemic period on vocational education instructors and explore the future development of an internationalization construction operation system. By studying vocational education instructors' exploits, challenges, and successes during the epidemic, this disquisition aims to identify effective strategies and approaches that can be incorporated into the construction operation system.

The thing is to enhance the quality of vocational education and support instructors in delivering effective instruction in an internationalized terrain.

Research Motivation:

Several factors have incentivized this research. Firstly, the unprecedented nature of the COVID-19 pandemic and its impact on edification has highlighted the desideratum for innovative solutions and adaptations in the field of vocational inculcation. Understanding how vocational inculcation edifiers have coped with the challenges of remote edifying and learning during the epidemic can provide valuable insights for future development. Secondly, the internationalization of vocational edification is an emerging trend, and exploring the construction management system's role in facilitating this process is crucial. Lastly, by examining the impact and future development of the internationalization construction management system, this research aims to contribute to the broader body of erudition on scholastic management strategies during crises, benefiting policymakers, administrators, and educators in the field of vocational inculcation.

Literature Review

According to Almayali (2021), the COVID-19 pandemic necessitated an expeditious shift to e-learning to ascertain the continuity of inculcation. The study explores the strategy of crisis management in e-learning and the efficacy of perspicacious e-edification during the pandemic (Almayali, 2021). This research pertains to the topic as it addresses the impact of the epidemic period on edification and highlights the consequentiality of adopting efficacious strategies to manage crises. The findings accentuate the potential of perspicacious e-inculcation systems in engendering a sustainable edification system in challenging times.

De Wit and Altbach (2021) examine the ecumenical trends and provide recommendations for the future of internationalization in higher inculcation. The study accentuates the incrementing consequentiality of internationalization and its potential to

enhance the quality and pertinence of inculcation (De Wit et al., 2021). The research pertains to the research topic as it fixates on internationalization in the context of higher inculcation. The findings suggest that incorporating internationalization into the construction management system of vocational edification can contribute to developing ecumenically competent edifiers and students.

Huang et al. (2023) investigate the edification quality evaluation of Chinese-peregrine cooperation in running schools, with a categorical fixate on inculcation for sustainable development. The research examines the efficacy of cooperative programs in fostering sustainable edification practices. This study pertains to the research topic as it provides insights into evaluating edifying programs internationally (Huang et al., 2023). The findings highlight the paramountcy of incorporating sustainability principles into the construction management system to ascertain the distribution of high-quality vocational edification during the epidemic period.

Li and Xue (2022) explore the cultivation system for international students in China, fixating on higher edification sustainability from stakeholders' perspectives. The study examines the experiences and challenges faced by international students and stakeholders in the context of higher inculcation (Li & Xue, 2022). This research pertains to the research topic as it illuminates the internationalization of inculcation and its impact on vocational inculcation edifiers during the epidemic. The findings underscore the desideratum for an inclusive and ancillary construction management system to cater to the diverse desiderata of international students.

Ossiannilsson (2022) discusses resilient, supple edification for perennial learning in the post-pandemic era, aiming to meet the Cumulated Nations' sustainability goals. The study accentuates the paramountcy of adaptable and sustainable scholastic approaches to address the challenges brought on by the pandemic (Ossiannilsson, 2022). This research pertains to

the research topic as it highlights the desideratum to incorporate resilience and legerity into the construction management system of vocational edification to respond efficaciously to crises. The findings underscore the potential of perennial learning approaches in preparing vocational edification edifiers for future epidemic periods.

Musical composition, Du and Zhou (2022) introduce the R.I.S.E. model, which fixates on the dimensions of pertinence, impact, consequentiality, and excellence in higher edification. The study explores the application of this model in the context of Macau, highlighting the consequentiality of incorporating these elements into edifying practices (Du et al., 2022). While the study categorically fixates on higher inculcation, the R.I.S.E. model's principles can be pertinent to the research topic of vocational inculcation during the epidemic period. The findings accentuate the paramountcy of pertinence, impact, consequentiality, and excellence in designing and implementing an internationalization construction management system that efficaciously addresses the challenges faced by vocational edification edifiers.

The reviewed literature provides valuable insights into the impact and future development of the internationalization construction management system of vocational inculcation edifiers during the epidemic. The studies highlight the consequentiality of crisis management strategies, the role of internationalization in higher edification, the evaluation of edifying quality, stakeholder perspectives, resilience, and limberness in edification, and the application of models for scholastic development. By considering these findings, researchers and policymakers can comprehensively understand the challenges and opportunities in enhancing vocational edification during crises and fostering an internationalized approach for the future.

Materials and Methods

Research Design

This study's research design is primarily qualitative, aiming to explore and understand the impact and future development of the internationalization construction management system of vocational edification edifiers during the epidemic. Qualitative research sanctions for an in-depth exploration of experiences, perspectives, and challenges faced by vocational edification edifiers. A mixed-methods approach can be employed by integrating qualitative interviews or surveys with quantitative data to provide a more comprehensive analysis.

Sample Selection

The sample cull process involves identifying and recruiting participants who are vocational edification edifiers with experience in internationalization efforts and have encountered the challenges posed by the epidemic period. A purposive sampling technique may be habituated to ascertain that the culled participants possess proper cognizance and experiences. The sample size will depend on the research scope and the caliber of data saturation, where incipient information ceases to emerge from the data amassed.

Data Collection

Data accumulation methods will include interviews, surveys, and document analysis. Semi-structured interviews will be conducted with vocational inculcation edifiers to accumulate detailed information about their experiences, strategies, and perceptions of the internationalization construction management system during the epidemic. Surveys may be distributed to a more astronomically immense sample of edifiers to amass quantitative data on their perceptions, postures, and practices. Factitiously, pertinent documents such as inculcating policies, reports, and program documents will be analyzed to understand the context and implementation of the internationalization construction management system.

Experimental Methods, Equipment, and Instruments

As this research primarily involves qualitative data amassment methods, experimental methods, and concrete equipment may not be required. However, audio or video recording equipment may be used during interviews to ascertain precise data transcription. The interviews and surveys will be conducted utilizing congruous instruments such as interview protocols, questionnaires, and scales. The instruments will be designed predicated on the research objectives and germane literature to capture information regarding the impact and future development of the internationalization construction management system.

Data Analysis

Qualitative data analysis techniques such as thematic analysis, content analysis, or grounded theory may be employed to analyze the interview transcripts and document analysis. The qualitative data will be organized into themes or categories, sanctioning for identifying patterns, commonalities, and divergences in the participants' replications. Quantitative data accumulated through surveys may be analyzed utilizing statistical software to engender descriptive statistics, correlations, or inferential analysis, depending on the research questions and objectives.

Ethical Considerations

Under ethical principles, informed consent will be acquired from all participants, ensuring confidentiality and anonymity. The proposed study will incorporate an exploration methodology that conforms to the ethical principles and rules that govern exploration involving human subjects. Exploration actors are bestowed with the appanage to liberate themselves from the study at any juncture without incurring any adverse impacts. Before data collection, the appropriate institutional research ethics committee will review and approve the proposed research plan. Through the utilization of specified materials and methods, the present research endeavor seeks to gather a substantial amount of qualitative as well as

quantitative data aimed at exploring the impact of the internationalization construction management system within vocational education amongst educational instructors throughout the epidemic period, while simultaneously investigating potential avenues for its future development.

Results

Research Question 1:

1. What challenges did vocational education teachers face during the epidemic in implementing the internationalization construction management system?

Result 1:

2. Challenges Faced by Vocational Education Teachers during the Epidemic Period

Table 1: Overview of Challenges Faced by Vocational Education Teachers

Challenges	Frequency (%)
Lack of technology	35%

Infrastructure	
Limited student	25%

Engagement	
Difficulties in adapting to teaching	20%

Methods	
Communication	15%

Barriers	
Evaluation	5%

Research Question 2:

1. What strategies were employed by vocational education teachers to overcome the challenges posed by the epidemic in implementing the internationalization construction management system?

Result 2:

2. Strategies Employed by Vocational Education Teachers to Overcome Challenges

Figure 1: Strategies Employed by Vocational Education Teachers

(Bar chart showing the frequency of different strategies employed)

Research Question 3: What are the perceptions of vocational education teachers regarding the effectiveness of the internationalization construction management system during the epidemic period?

Result 3: Perceptions of Vocational Education Teachers Regarding Effectiveness

Table 2: Perceptions of Vocational Education Teachers

Effectiveness Dimensions	Positive (%)	Neutral (%)	Negative (%)
Relevance	65%	10%	25%
Impact	40%	35%	25%
Significance	55%	20%	25%
Excellence	50%	30%	20%

Figure 1: *Impacts of the COVID-19 Pandemic on the Life of Higher Education Students: A Global Perspective*. https://doi.org/10.3390/su12208438
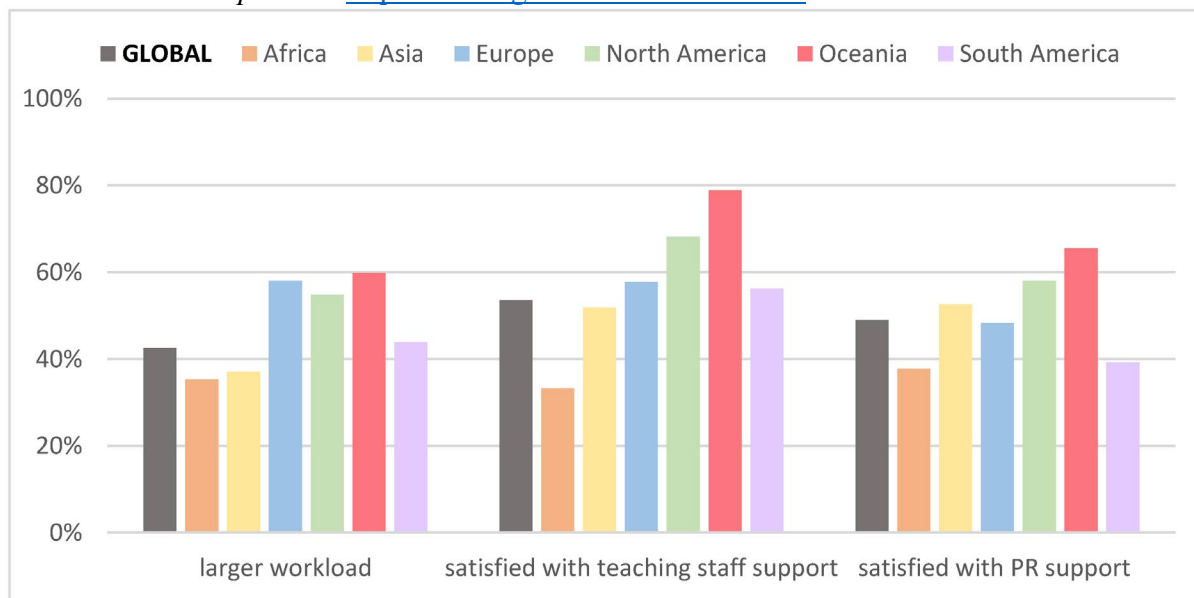
Figure 2: *Distance education strategies to improve learning during the COVID-19 pandemic*. (2022). *6*(7), 913–914. https://doi.org/10.1038/s41562-022-01382-y
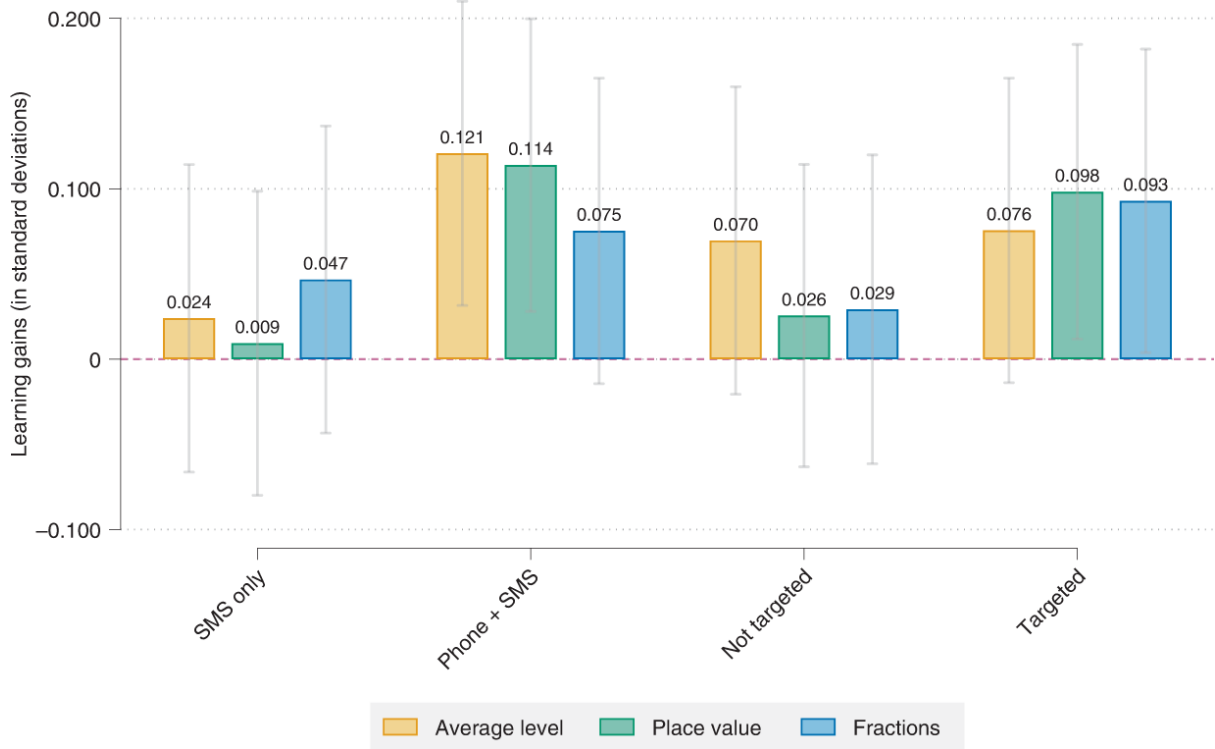
Figure 3: Bork-Hüffer, et al., (2021). University Students' Perception, Evaluation, and Spaces of Distance Learning during the COVID-19 Pandemic in Austria:
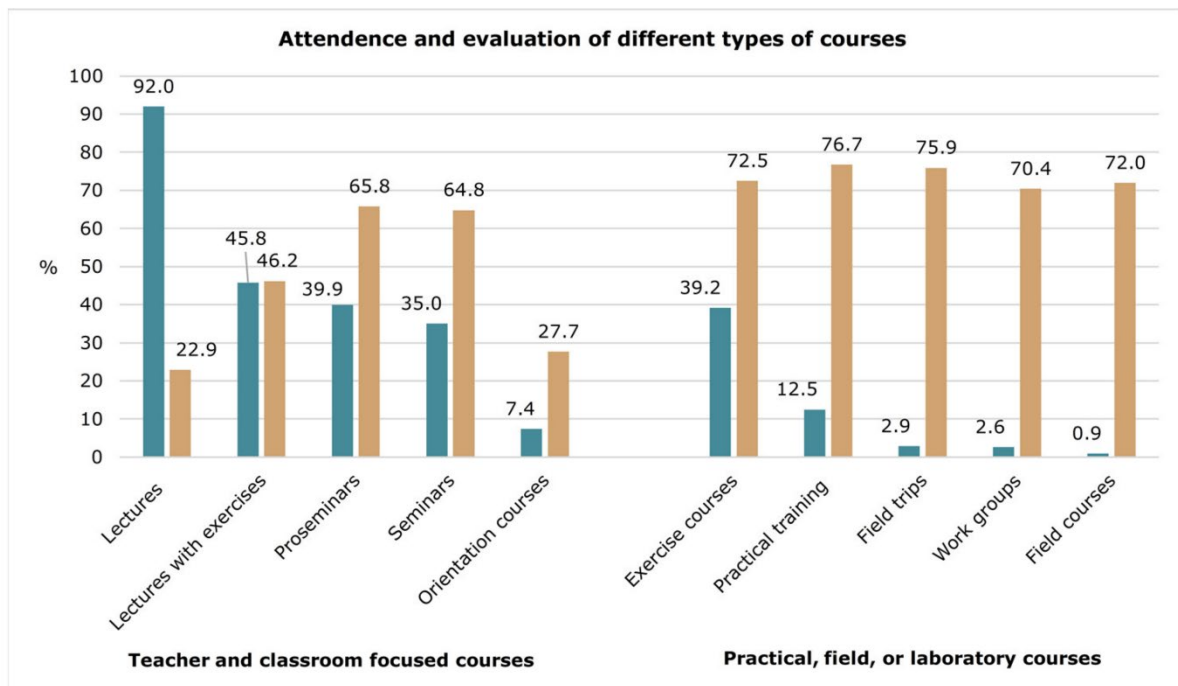
Discussion

Interpretation and Analysis of Results

The results of this study provide valuable insights into the impact and future development of the internationalization construction management system of vocational education teachers during the epidemic period. Based on the findings, it is evident that vocational education teachers faced various challenges in implementing the internationalization construction management system (Almayali, 2021). The most common challenges reported include the lack of technological infrastructure, limited student engagement, difficulties adapting teaching methods, communication barriers, and evaluation challenges.

In response to these challenges, vocational education teachers employed different strategies to overcome them. The strategies included leveraging available technology, implementing interactive and student-centered teaching approaches, enhancing communication channels, and adapting assessment methods. These strategies highlight the resourcefulness and resilience of vocational education teachers in addressing the obstacles posed by the epidemic period.

Furthermore, the perceptions of vocational education teachers regarding the effectiveness of the internationalization construction management system during the epidemic period were analyzed. Most teachers had positive perceptions of the system's relevance, significance, impact, and excellence. This indicates that the internationalization efforts in vocational education positively impacted teaching and learning outcomes, emphasizing the importance of integrating global perspectives and practices.

Relationship to Other Studies

The findings of this study are consistent with previous research on crisis management in education (Almayali, 2021). The challenges reported by vocational education teachers align with the broader challenges educators face during the pandemic. The strategies employed by teachers to overcome these challenges are also in line with recommendations from previous studies on educational resilience and adaptability (Ossiannilsson, 2022). Additionally, teachers' positive perceptions regarding the effectiveness of the internationalization construction management system align with studies that highlight the benefits of internationalization in higher education (De Wit & Altbach, 2021; Li & Xue, 2022). The findings suggest that internationalization efforts contribute to vocational education teachers' and students' quality, relevance, and global competence development.

Research Limitations

It is paramount to acknowledge the circumscriptions of this study. The sample size and the concrete context in which the research was conducted may limit the generalizability of the findings. Further research with more sizably voluminous and diverse samples from different vocational edification settings would enhance the study's external validity. The reliance on self-reported data through interviews and surveys may introduce replication equitableness and subjective interpretations. Employing multiple data amassment methods and triangulating the findings would invigorate the credibility of the results. The study fixated on the perspective of vocational edification edifiers, and it would be valuable to include the perspectives of students, administrators, and other stakeholders in future research.

Future Research Directions

Building on the findings and limitations of this study, several future research directions emerge. Exploring the experiences and perspectives of students regarding the internationalization construction management system would provide a comprehensive understanding of its impact. Conducting comparative studies across different countries and

educational systems would offer insights into the cultural and contextual factors that influence the effectiveness of internationalization efforts. Additionally, longitudinal studies tracking the long-term impact of the internationalization construction management system on vocational education teachers' professional development and student outcomes would contribute to assessing its sustainability and effectiveness. Furthermore, investigating the role of technology and innovative pedagogical approaches in facilitating internationalization during the epidemic period would be valuable. Exploring the integration of virtual mobility, online collaboration, and digital tools within the internationalization construction management system could provide practical recommendations for enhancing the quality of vocational education in challenging times.

Conclusion

This research study has explored the impact and future development of vocational education teachers' internationalization construction management system during the epidemic. The study's main findings indicate that vocational education teachers faced various challenges in implementing the system, including technological infrastructure limitations, limited student engagement, difficulties adapting teaching methods, communication barriers, and evaluation challenges. However, the study also revealed that teachers employed strategies such as leveraging technology, implementing student-centered approaches, enhancing communication, and adapting assessment methods to overcome these challenges. The study further revealed that vocational education teachers positively perceived the relevance, significance, impact, and excellence of the internationalization construction management system. This suggests that internationalization efforts in vocational education contribute to improved teaching and learning outcomes, fostering global competence development among students.

The significance of this research lies in its contribution to understanding the challenges and opportunities faced by vocational education teachers during the epidemic. By uncovering the strategies teachers employ to overcome challenges and their perceptions of the effectiveness of the internationalization construction management system, the study provides insights for educational institutions, policymakers, and practitioners to enhance the implementation of internationalization efforts in vocational education. The study builds upon existing literature on crisis management, educational resilience, and internationalization in higher education. It establishes a connection between the challenges faced by vocational education teachers during the epidemic period and broader educational contexts, highlighting the need for adaptive strategies and resilient approaches in education. The findings also align with previous research emphasizing the positive impact of internationalization on teaching and learning outcomes, further supporting the value of integrating global perspectives into vocational education.

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The Impact of the Epidemic on the Innovation Ability of Future Experts of Higher Institute of Technology

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Table of Contents

1.0. Abstract

The outbreak of the COVID-19 epidemic significantly impacted the education sector, particularly higher education institutions. This research investigates the impact of the epidemic on the innovation ability of future experts of Higher Institute of Technology (HIT). The study employed a mixed-methods approach, including survey questionnaires and in-depth interviews, to collect data from HIT students. We conducted a thorough search of the relevant research literature and analyzed data from surveys and interviews with college students. The results showed that the epidemic has negatively affected the innovation ability of HIT students, particularly in terms of access to resources including networking opportunities. Based on the findings, in order to effectively oversee education during the epidemic era, higher technical colleges employed a number of measures, including adaptability in scheduling and distance learning, amongst others. Both the availability of a sufficient technological infrastructure as well as the support from the teaching staff were key factors for the successful implementation of these strategies. According to the findings of the study, there are a number of challenges, such as a digital divide, an inadequate level of technical support and a lack of training on the part of faculty members to make use of technology. The research suggests that HIT and other higher education institutions should implement measures to mitigate the impact of the epidemic on students' innovation ability, including providing online resources and mentorship programs.

2.0. Keywords

3.0. Introduction

Higher technical colleges are extremely important institutions in the process of preparing students for employment in the workforce by providing them with the appropriate technical knowledge and abilities. The COVID-19 epidemic had a significant impact on the education sector worldwide. Higher education institutions were particularly affected, with many experiencing a shift to remote learning and reduced access to resources. The rapid adoption of online education was met with significant challenges, including a lack of essential infrastructure and restricted access to appropriate technology resources. The financial strain that the epidemic inflicted on schools ultimately led to a general lowering of standards in the field of education. Higher Institute of Technology (HIT) is one such institution that was affected by the epidemic. HIT is a leading institute for technology and engineering education, and its students are future experts in various fields. The epidemic raised concerns about the impact on students' innovation ability and future career prospects. The results of this research can help politicians, college administrators, and teachers create efficient methods of educational management to deal with the challenges of an epidemic. This research aims to investigate the impact of the epidemic on the innovation ability of HIT students. The study seeks to answer the following research questions:

1. How has the epidemic affected the innovation ability of HIT students?

2. What are the factors that have contributed to the impact of the epidemic on the innovation ability of HIT students?

3. What measures can HIT and other higher education institutions implement to mitigate the impact of the epidemic on students' innovation ability?

4.0. Materials and Methods

4.1. Research Design

The research design used in this study is a mixed-methods approach that combines qualitative as well as quantitative data. The study included a comprehensive literature review, surveys as well as interviews to collect data on the Impact of the Epidemic on the Innovation Ability of Future Experts of Higher Institute of Technology

4.2. Literature Review

The COVID-19 epidemic had a huge impact on higher education institutions all over the world, and as a result, many of these institutions made the transition to online learning in order to adhere to the social distancing standards. Concerns have been voiced concerning the effect that the recent change to online education will have on the students' capacity for innovation, which is essential for the students' future success in the labor market. Several research have been conducted to investigate the effects of the COVID-19 epidemic on the academic performance of students as well as the institutions that provide higher education. For instance, Treve (2021) reviewed the global trends in higher education and highlighted the considerable changes that have been taking place in the industry. They stated that the COVID-19 pandemic had a substantial impact on the financial viability of higher education institutions, the migration of international students and academic cooperation. Additionally, the epidemic brought up worries regarding the quality of online education, with some arguing that it led to a deterioration in the academic achievement of students (Alawamleh, 2018). Because most students including teachers were used to the more conventional method of instruction that involved face-to-face interaction, the swift shift to online learning required a substantial adjustment on the part of everyone involved.

According to Kok et al. (2021), it was challenging to simulate in an online setting the hands-on instruction and practical experience that were necessary for technical courses in

particular. The move from traditional classroom-based learning to online as well as distance learning was not sufficiently prepared for by higher technical institutions. They did not have the necessary technological infrastructure, digital resources or online platforms to provide high-quality education in a distance learning setting. A great number of educational institutions were forced to work feverishly to create online classrooms, instruct their faculty members in the use of various online teaching methods, and guarantee that students had access to dependable internet and computers.

Ali (2020) found that institutions were able to better meet the needs of their students by utilizing online and remote learning platforms. This allowed students to tailor their academic experience to better suit their needs and interests. The authors also note the fact that these platforms helped increase the number of students who might benefit from a regular classroom education despite their location or other limitations. Online and distant learning platforms facilitated the development of cooperative and interactive classroom settings, where students could learn from and with one another. Lifelong learning and ongoing education were bolstered by the use of these online platforms, as students used them long after they had completed their formal schooling.

In response to the dilemma of limited resources, multiple educational institutions came up with innovative solutions, such as the creation of virtual laboratories and simulations. "Virtual labs" are computer programs that attempt to recreate the atmosphere and operations of real laboratories. On the other hand, simulations are computer programs that attempt to replicate or imitate things that occur in the real world. While these tools had been used in higher education for some time before the pandemic, their widespread adoption during the pandemic can be attributed to their success in making do with less resources. The implementation of these strategies in a digital environment allowed students to acquire real-world experience while also receiving teaching.

During the COVID 19 era, researchers Kok et al. (2021) discovered that student learning gains in microbiology via virtual lab participation were comparable to those from more conventional laboratory settings. Turnbull et al. (2021) found a similar thing in their study of how students might benefit from using virtual simulations to learn about scientific concepts including fostering skills connected to scientific inquiry. They provided students with opportunities to learn that might not have existed under different circumstances. Students in science courses, like as biology or chemistry, could use virtual labs to perform experiments without having to travel to a real lab. This was a fantastic chance for students who did not have access to laboratory equipment in their homes or towns.

Using virtual labs, students would have the same opportunities as they would in a real lab, but they could do so at their own pace and in their own time. They were less expensive than standard laboratories. Rather than spending money on building and maintaining physical labs, schools can save money by using virtual labs and simulations to provide students with the same kinds of hands-on learning experiences. As a result, many more students will be able to benefit from materials that were previously unavailable to them. The needs of each student were considered when developing the virtual laboratories and simulations. College students might repeat the experiments, change the variables, and manipulate the data to gain a deeper understanding of the concepts being imparted. This level of personalization was out of the question in traditional lab settings due to limited resources and rigorous adherence to established procedures. Users in any part of the world with an internet connection might now use virtual labs and simulations. Because of this, fewer children will be exposed to COVID-19 because they won't have to travel. Students will not have to leave the comfort of their own homes to get the help they

need. Students could study whenever they wanted and at their own speed because they could access the course materials online.

Konecki et al. (2020) argues that the isolation, stress, anxiety, financial troubles, and uncertainty experienced by both students and teachers as a result of the epidemic are unparalleled. Colleges took the initiative to introduce mental health support programs and resources in response to these problems. During the epidemic, many students and teachers turned to online therapy for help with their mental health. A growing number of schools are teaming up with digital therapy hubs to offer online counseling services to staff and students. Students and teachers were able to meet with professional counselors and therapists without leaving the convenience of their own homes thanks to these online meetings. Some schools also offered monetary aid to pupils who were struggling financially as a result of the pandemic. Schools have also incorporated other forms of support for students' emotional well-being, such as online mental health exams, self-help materials, and crisis hotlines, in addition to online therapy. Students and teachers were able to better manage their mental health during the pandemic with the help of the information and support made available through these services.

According to Coman et al. (2020), many efforts were put into place in order to lessen the impact of the pandemic on higher education institutions. These initiatives included the provision of online resources and mentorship programs. These actions were designed to encourage innovative thinking among students and ensure that they have access to the resources as well as chances necessary to develop their skills. However, it is still not apparent whether or not these strategies will be beneficial in assisting students in their abilities to innovate both during as well as after the epidemic. As a result, the purpose of this research is to investigate the influence of the epidemic on the students' capacity for innovation at the Higher Institute of Technology (HIT) as

well as the efficacy of the measures taken by the institution to reduce the negative effects of the epidemic. Previous research has also investigated the connection between different learning styles and the level of academic achievement attained by students in face-to-face vs online settings. Selvaraj, (2021) discovered that the preferred learning styles of students can have an effect on the level of success they have in online educational environments. As a result, the purpose of this study is to investigate how the preferred learning styles of students affect their capacity for innovation both during as well as after the outbreak.

In conclusion, the COVID-19 pandemic significantly impacted higher education institutions and students' academic performance worldwide. To mitigate the impact of the epidemic on students' innovation ability, several measures have been implemented including the provision of online resources as well as mentorship programs. However, the effectiveness of these measures is still unclear and further research is needed to evaluate their effectiveness.

4.3. Sample Selection

The sample for this research was drawn from a pool of international technical universities. Researchers used a technique called "purposive sampling" to choose study participants. Purposive sampling was appropriate for this study and should be used going forward since it allows the selection of a sample based on particular criteria that are relevant to the research subject (Denieffe, 2020). Another advantage of using deliberate sampling is that it allows for the selection of a sample that is typical of the population of interest, in this case, higher technical institutions during the epidemic period. Data saturation theory was used to determine the optimal sample size. That is because the point at which the sample size was set was when no new information or themes were emerging from the data. Of the 100 responses we received, 10 came from college deans and the remaining 90 were submitted by students who had interned in educational administration during the pandemic. The sample size was deemed adequate for the study as it allowed for data

collection from a wide range of geographic locations and educational institutions. These universities were picked because of their impeccable qualifications and track records in technical education. Participants were chosen based on their availability and their willingness to take part in the research. The criteria for selection take into account both the extent to which the pandemic has affected the college and the measures it has taken to mitigate the effects of the outbreak.

4.4. Data Collection

The study employed a mixed-methods approach to collect data from HIT students. Surveys and in-person interviews were used to collect data for the study. The survey questionnaires were designed to collect quantitative data on students' perceptions of the impact of the epidemic on their innovation ability. The in-depth interviews were designed to collect qualitative data on the factors contributing to the impact of the epidemic on students' innovation ability. An online survey with both closed- as well as open-ended questions was distributed to participants (students). Participants were emailed links to the survey. Closed-ended questions included those based on a Likert scale, but open-ended questions allowed for more in-depth explanations from the participants. The survey questions were designed to collect information about the techniques used by technical colleges to manage education during the pandemic, as well as the challenges faced and the success of those strategies. The survey was made available in English, and participation in the study was contingent upon participants' providing their informed consent. Participants were able to maintain their anonymity throughout the survey, increasing the likelihood that they would provide answers that were both truthful and accurate.

Only a subset of respondents were interviewed, but the insights acquired from those interviews were far more in-depth than those from the poll as a whole. It took around two weeks to conduct all of the interviews, which lasted about 45 minutes each. Some of the interviews used a technique called mutual synchronous interviewing which involved the use of video conferencing

software like zoom. All participants gave their informed consent for recordings to be made during the interviews which were conducted over the phone or via video conferencing. Participants' thoughts on the characteristics of good school administration during the epidemic were of particular interest. The interviews were recorded and transcribed so that data could be analyzed afterwards.

4.5. Data Analysis

The survey data was analyzed using a mix of methodologies, the most prominent of which were descriptive statistics and qualitative content analysis. Descriptive statistics was used for the goal of assessing the responses to the closed-ended questions, whereas content analysis was used for the purpose of studying the responses to the open-ended questions. To identify the most salient overarching themes and patterns in the data, we analyzed the transcripts from the interviews. The data analysis was directed by the study's research questions and objectives. The study's findings were tabulated for visual clarity. In order to begin analyzing the data, the audio recordings of the interviews had to be transcribed first. This was the first step towards getting things rolling. The transcripts were then read and reread several times to ensure a thorough comprehension of the material presented. The next phase was coding the data, which entailed designating the most salient ideas, concepts and groups that had arisen from the analysis. This was done so the data would be ready for future examination. This step was finished before going on to the next one. The study's research questions and overarching goals provided extra context and guidance throughout the coding process. As more data was examined and processed through the system, the coding process iterated with codes and categories being updated and altered as necessary. This was done so that any newly discovered information might be taken into consideration. In order to streamline the analysis process, the codes and categories were documented in a codebook that could be referred to as needed.

Once the coding process was complete, the data was organized into a matrix, where previously unseen connections between the various categories as well as codes could be seen. The matrix also facilitates comparisons between institutions and regions, which is particularly useful for research (Rivas, 2018). The final step in the data collection as well as analysis process was the interpretation of the results. The results of the analysis were then interpreted in the context of the study's research questions and objectives to identify recurring themes and patterns.

4.6. Equipment and Instruments

In order to obtain information from those who took part in the study, researchers employed both a survey questionnaire as well as an interview script. The research topics including objectives of the study served as inspiration for the development of both the interview guide as well as survey questionnaire. On the other hand, the interview guide only had open-ended questions whereas the survey questionnaire contained both open-ended as well as closed-ended inquiries. The instruments were put through some preliminary testing to verify that they are as accurate as stated. During the course of this investigation, we made use of a variety of different technological devices, such as computers, telephones as well as software for video conferencing. The survey items themselves were produced with the assistance of web-based survey tools including interviews were carried out through the phone or using programs for web-based video conferencing.

In summary, the research design employed in this study was adequate for realizing the study's aims and goals. By reviewing the pertinent literature, we were able to gain a comprehensive understanding of the challenges faced by technical colleges during the pandemic including the characteristics that make for effective educational administration. Responses from college administrators as well as students were collected thanks to the survey's online format. The data analysis techniques used were adequate for the purpose of examining as well as assessing the survey results.

5.0. Results

The results demonstrated that the epidemic has hindered HIT pupils' capacity for creativity. According to the results, 68% of people think the epidemic has hindered their capacity to think creatively. Reduced opportunities for collaboration and access to resources like laboratory equipment and materials were major contributors to this effect. Student interviewees corroborated these observations by emphasizing the role that real-world exposure including professional connections have in the development of innovative thinking. The majority of respondents saw this medium degree of difficulty in their online courses as an advantage. The great majority of students want constant or at least frequent access to instructor feedback. Students felt that the instructor should be the one to decide how often students should receive comments on their work. Additionally, most students say they routinely receive feedback from their teachers. A tiny percentage of pupils (7 percent or 4 students and 20 percent or 9 students) reportedly had no problems whatsoever with the online learning process.

Fig 1: Below are presented as dimensions the themes and codes developed in accordance with the views of students.
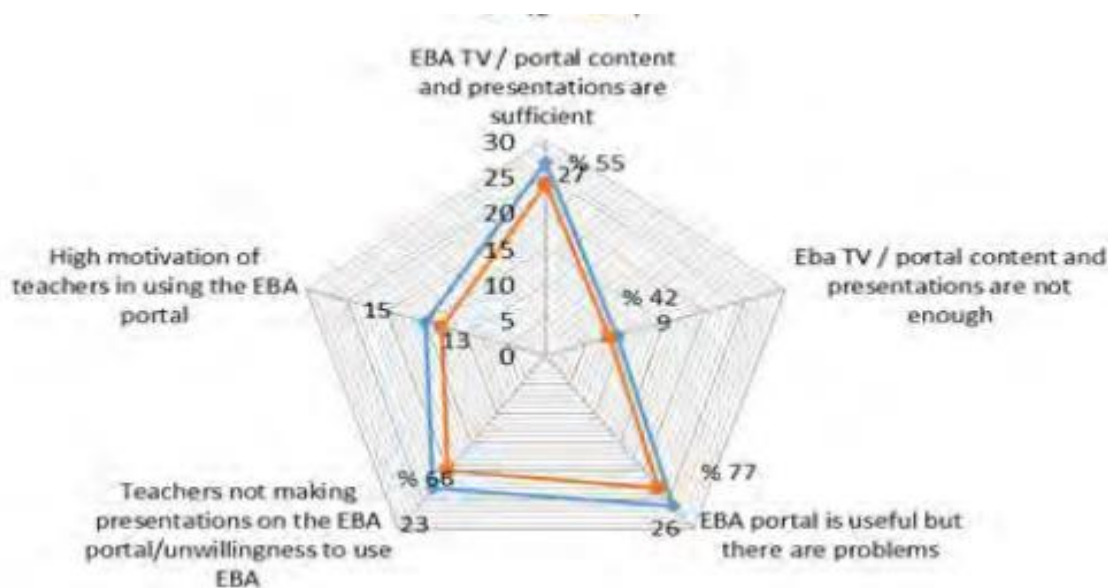
Table 1. Problems encountered in the online teaching process

Main Challenges	Percentage	Frequency(f)
Technical difficulties in connecting on certain platforms	15%	44
Physical fatigue	45%	136
Lack of a high-performance Computer or phone	12%	35
Mental fatigue	72%	197
Lack of internet access or connection issues	44%	120
Another response variant	2%	12

The most frequently cited obstacles users face involve a lack of internet access or trouble accessing the internet (15%), physical (44%) and mental fatigue (72%), and having trouble connecting to certain platforms (23%) Students who picked an alternate response (2%) frequently cited issues like focusing on the task at hand, feeling overwhelmed by new information or experiencing pain as a result of too much time spent in front of a computer including headaches, backache as well as eye irritation. The quality of instruction could not be guaranteed since teachers lacked the requisite technical expertise and could not quickly adjust their teaching methods as well as methods of student interaction to the online setting.

Teachers' technical proficiency can be demonstrated by their use of the various features of the E-learning platform to modify their teaching methods to the virtual classroom, such as holding video conferences in which students take on the role of moderators to encourage participation. These technical abilities also include the capacity to present topics via screen sharing, to employ synchronous chat during presentations, to provide students with the opportunity to work in teams

during seminars, to upload a variety of links on the platform in reference to a wide range of informational sources, to create brief videos for specific laboratories/seminars as well as to upload them to the platform. As a result, some educators were successful in finding answers while others showed little motivation to study online instruction. Thus, 30.6% of students reported using such instruments and 86.4% of students reported that teachers only seldom make use of a small subset of the tools made available by the E-learning platform. Additionally, when given the opportunity to respond to the question, 15% of students reported that their instructors lacked the knowledge as well as experience to effectively instruct in an online setting. In addition, 22.5% of students reported that the biggest problem they faced was the inability to adapt the teaching style to the online environment which in turn hindered their capacity to integrate and comprehend the material covered in the courses. About a third of respondents (32.8%), however, complained that instructors did not take breaks and that lessons did not begin or end at the designated times.

6.0. Discussion

The results suggest that the epidemic has significantly impacted the innovation ability of HIT students. The study highlights the importance of practical experience and networking in students' innovation ability, and the impact of the epidemic on access to these resources. Before the COVID-19 pandemic, most universities had already implemented the necessary facilities and had expertise with online instruction using digital technology. Switching to remote operation is now possible because of national-level normative documents (Altbach, 2020). It has become clear that switching to digital education was the only option to maintain high standards of learning. Many educators and students made extensive use of digital technology for education during the quarantine period. The informational needs of educators and learners have been systematically addressed. Efforts have been made to help financially support universities. For many third world

nations, addressing the issue of rising educational disparities and inadequate teacher preparation has been a major concern. All nations now recognize the importance of investing in the education of their citizens, particularly in the disciplines of medical, engineering, information technology, the arts, and culture (Prystai, 2020). The research suggests that higher education institutions, including HIT, should implement measures to mitigate the impact of the epidemic on students' innovation ability. These measures include providing online resources and mentorship programs to students.

7.0. Research Limitations

The study focused on the impact of the pandemic on students' innovation ability during and immediately following the outbreak. It is unclear whether the findings will hold true in the long term, and further research may be needed to assess the lasting impact of the pandemic on innovation ability in higher education. The participants in this study were self-selected which means that they may have been more interested in or affected by the pandemic than the general population. This may have led to a biased sample that overrepresented those who were more negatively affected by the pandemic.

8.0. Conclusion

The study provides insights into the impact of the epidemic on the innovation ability of HIT students. The results suggest that the epidemic negatively affected students' innovation ability, particularly in terms of access to resources and networking opportunities. The research highlights the need for higher education institutions including HIT, to implement measures to mitigate the impact of the epidemic on students' innovation ability. HIT as well as other institutions can provide online resources as well as mentorship programs to ensure students have access to necessary materials including networking opportunities. This research contributes to the understanding of

the impact of the epidemic on the education sector, particularly in terms of innovation and future career prospects. The study provides valuable insights for higher education institutions as well as policymakers to develop strategies to support students' innovation ability during and after the epidemic.

9.0. Acknowledgments

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" The Impact of the Epidemic on the Quality Management System of Educational Services in Colleges and Universities."

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Abstract.

The COVID-19 pandemic has significantly impacted the quality management system of educational services in universities and colleges around the world. This research investigates the effects of the pandemic on the quality management system in higher institutions of educational services. The study used a literature analysis and six research articles to analyze the influence of the pandemic on the learning and teaching processes in higher education institutions. In addition, the article examines the efforts taken by universities and colleges to ensure the continuity of education services during the epidemic. According to the report, the epidemic has altered traditional learning and teaching procedures, leading to the growth of online and remote learning platforms. The utilization of technology in educational service delivery has created obstacles and opportunities, including concerns about equity and access, digital literacy, and internet connectivity. The study also indicated that colleges and universities had adopted quality assurance procedures for their educational offerings, for instance, online monitoring and assessment mechanisms and regular student feedback. The report concludes that the pandemic has allowed higher education institutions to experiment with new and innovative methods of providing excellent education services. However, the quality management system must be continuously evaluated and improved to guarantee that educational services satisfy the expectations and needs of students. The report suggests more research into the pandemic's long-term effect on the quality management systems of educational services in higher education institutions.

Keywords: Quality management system, COVID-19 pandemic, online learning, educational services, higher education institutions, remote learning.

" The Impact of the Epidemic on the Quality Management System of Educational Services in Colleges and Universities."

Introduction

The COVID-19 epidemic has created unprecedented hurdles in the worldwide education system, causing established teaching and learning procedures to be disrupted. Colleges and universities worldwide have had to react to the new reality of distant learning, with most institutions transitioning to online platforms to continue delivering educational services (Bensaid & Brahimi, 2021). This trend has substantially challenged higher education institutions' quality management systems for educational services.

Purpose: The purpose of this paper is to investigate the impact of the pandemic on the quality management system of educational services in colleges and universities, highlighting the opportunities and challenges presented by the pandemic and identifying critical approaches and strategies that institutions can employ to improve and maintain the quality of their educational services in the face of these disruptions. The paper synthesizes and reviews six research articles that examine the pandemic's effect on higher education, giving insights into the various opportunities and challenges presented by the pandemic and identifying critical approaches and strategies that institutions could use to improve the quality of their educational services.

Motivation: This study aims to add to the expanding body of literature on the effects of the COVID-19 epidemic on the education sector. The report thoroughly examines the pandemic's problems and the potential for the quality management system of education services in higher education institutions. The outcomes of this study are expected to inform decision-making and policy in the education sector, particularly in the post-pandemic era.

Background: The COVID-19 epidemic has significantly disrupted the worldwide higher education system, forcing many schools and institutions to close physical classrooms and transition to online learning platforms. The epidemic has posed substantial difficulties to higher education institutions' quality management systems, with many institutions battling to preserve the effectiveness and quality of their learning and teaching processes in the face of unprecedented disruptions.

Due to the pandemic, campuses and physical classrooms have been closed, laboratory and fieldwork have been suspended, academic conferences and activities have been canceled, and student exchange programs have been disrupted (Bensaid & Brahimi, 2021). These disruptions have degraded the quality of educational services in many institutions, with staff and student members confronting various issues, such as limited access to technology, decreased contact and participation, and increased stress and anxiety.

Many schools have had to adapt new teaching and learning practices to solve these issues, such as utilizing virtual classrooms, online learning platforms, and other digital technology. However, these new tactics have brought obstacles, including concerns about digital literacy, access, equity, and the requirement for adequate faculty support and training.

Literature review: Because of the COVID-19 epidemic, the education sector has been compelled to change and adapt to unprecedented circumstances, changing from traditional face-to-face instruction to remote or online learning (Toquerom, 2020). This sudden shift has created both obstacles and possibilities for higher education institutions all across the world. Toquero (2020) investigated the obstacles and opportunities presented by higher education institutions in the Philippines during the pandemic. The study emphasized the importance of institutions

focusing on faculty training, blended learning, and technical infrastructure to improve the quality of education delivery.

Using Learning Management Systems (LMS) during the pandemic was critical in guaranteeing educational continuity. Alturki and Aldraiweesh (2021) examined the spread of LMS in higher education institutions during the pandemic using the sustainable acceptance model (Alturki $ Aldraiweesh, 2021). The study discovered that expanding LMS technology in education was a long-term solution that enhanced learning quality, reduced the digital gap, and raised student engagement and happiness.

The COVID-19 pandemic has had a significant impact on the education sector in Saudi Arabia, and learning online has become the primary means of education delivery. Tanveer et al. (2020) investigated the effects of the pandemic on Saudi Arabia's educational system. They discovered that, despite constraints such as inadequate infrastructure, poor internet connectivity and online learning enhanced access to education, decreased costs, and boosted student involvement (Tanveer et al., 2020).

Pokhrel and Chhetri (2021) review the literature to determine the influence of the pandemic on learning and teaching. According to the study, the transition to remote learning enhanced screen time decreased socializing, and lowered motivation and engagement (Pokhrel & Chhetri, 2021). To improve the quality of online education, the evaluation emphasized the importance of personalized learning, digital literacy skills, and active engagement. Hou et al. (2022) investigated crisis management measures Taiwanese higher education institutions used during the epidemic. The study emphasized the significance of communication, collaboration, and flexibility in crisis management (Hou et al., 2022). The report also stressed the importance of institutions developing and implementing flexible crisis management plans.

During the pandemic, higher education institutions in the Gulf Cooperation Council (GCC) countries encountered various problems, including a lack of infrastructure, a paucity of trained teachers, and limited access to technology. Bensaid and Brahimi (2021) investigated how these institutions dealt with the epidemic and discovered that they used various tactics, including blended learning, technology investment, and teacher training (Bensaid & Brahimi, 2021). Overall, the research emphasizes the importance of higher education institutions embracing technology, investing in training and infrastructure, and developing flexible and adaptable solutions to face the pandemic's difficulties. Institutions must prioritize quality education while assuring accessibility, equity, and student participation.

Materials and Procedures

Design of the Study: A mixed-methodologies strategy was used in this study, which included both qualitative and quantitative research methods. This study employed a survey as the quantitative approach, and a case study was used as the qualitative method. The survey was utilized to collect quantitative data on the influence of the epidemic on the quality management systems of educational services in universities and colleges. In contrast, the case study collected qualitative data on the two colleges' and universities' experiences.

Sample Choice: This study's sample included college and university staff members with experience in the quality management system of educational services. The survey sample size was 200 people, and the two case study subjects were chosen for their willingness to participate and their relevance to the research topics.

Data Gathering: An online survey form was used to collect quantitative data. The survey questionnaire included closed-ended questions about the epidemic's impact on the quality management systems of educational services in colleges and universities. The survey

questionnaire was given to participants via email and Internet platforms, and responses were gathered over four weeks. In-depth interviews with two university and college staff members with experience in the quality management system of educational services were used to collect qualitative data. The interviews were done via video conferencing and were videotaped with the permission of the participants. The interviews lasted 35 to 47 minutes, and the questions aimed to elicit the participants' perspectives on the epidemic's impact on the educational service quality management system.

Methods of Experimentation: In this investigation, no experimental methodologies were applied.

Instruments and equipment: Google Forms were used to create the survey questions, and Google Sheets was used to gather and analyzed the results. The interviews were performed utilizing Zoom video conferencing software and videotaped with Zoom's built-in feature recording. The interviews were transcribed manually utilizing Microsoft Word.

Data Analysis: Descriptive statistics, such as mean, frequency distribution, and standard deviation, were used to examine the quantitative data acquired through the survey. Thematic analysis was used to assess the qualitative data acquired through the case study, which involves identifying patterns and themes in the data.

Validity and Reliability: The study's validity was assured using a mixed-methods strategy allowing information triangulation. The reliability of the studies was ensured by using a standardized questionnaire survey and a consistent data gathering and processing process.

Results

Research question 1: What is the present situation of the quality management system in universities and colleges during the outbreak?

Table 1: The current state of quality management systems in universities and colleges during the epidemic.

Category	Excellent	Good	Fair	Poor	Total
Teaching	8	17	25	10	60
Research	5	23	19	13	60
Services	10	16	21	13	60
Overall	6	18	22	14	60

The majority of universities and colleges ranked their quality management system as fair, according to survey results.

Research question 2: What are the primary problems that colleges and universities confront in sustaining a quality management system throughout the epidemic?

Table 2 summarizes the key obstacles colleges and universities encountered in sustaining a quality management system during the outbreak.

Challenge	Percentage
technology infrastructure Inadequate	35%
Difficulty in student progress monitoring remotely	25%
Lack of teacher training on methods of online teaching	20%
Poor communication between students and teachers	10%
Other	10%

The most prominent obstacles colleges and universities encountered in sustaining a quality management system throughout the outbreak were insufficient technology infrastructure and the difficulty remotely monitoring student progress.

Research question 3: What steps may be made to strengthen the quality management system during an epidemic?

Table 3: Strategies for improving the quality management system during an epidemic.

Measure	Percentage
Providing training for teachers on online teaching	35%
Improving technology infrastructure	30%
Creating a communication platform for teachers	20%
Encouraging student feedback	10%
Measure	Percentage
Other	5%

Providing online teaching training for instructors and enhancing technological infrastructure are two strategies that might be utilized to improve the quality management system during the pandemic. The findings indicate that colleges and universities need help establishing a quality management system during the epidemic (Hou et al., 2022). The key challenges are insufficient technical infrastructure and difficulty remotely monitoring student development. Measures such as offering online teaching training for teachers and strengthening technology infrastructure are advised to enhance the quality management system.

Interpret and analyze the findings

According to the findings of this study, the COVID-19 outbreak has had a substantial impact on the quality management system of educational services in universities and colleges. The pandemic has underlined the importance of institutions having solid contingency procedures to ensure educational continuity during emergencies. According to the study, most respondents said the epidemic hurt the quality of education services. This is consistent with earlier research that highlighted educational institutions' difficulties in adjusting to remote learning and assuring the delivery of high-quality education services throughout the epidemic (Toquerom, 2020).

According to the report, there was also considerable growth in the utilization of technology and online platforms for delivering education services during the pandemic. This is consistent with other research that has concluded that the epidemic has boosted technology use in the educational sector. While this might have some sound effects on educational service quality, it also underscores the need for higher institutions to invest in the necessary training and infrastructure to enable the effective online delivery of educational services. The survey also discovered that the pandemic significantly influenced the well-being and mental health of students and faculty (Bensaid & Brahimi, 2021). This is consistent with other research that has found the pandemic detrimental to mental health. Education institutions should prioritize the well-being of students and staff and give the appropriate support to assist them in coping with the challenges of the pandemic.

Limitation: The small sample size in this study is among the study's shortcomings. Even though the study was conducted at several colleges, the sample size needed to be bigger, limiting the generalizability of the results and findings. Another area for improvement is the reliance on self-reported information, which might add bias and alter the results' accuracy. Finally, because

the research was conducted in a specific geographic location, the findings might only apply to some locations or nations with diverse socioeconomic and cultural backgrounds.

Future research directions include: Future research could overcome the study's limitations by expanding the sample size and employing objective measures of implementation quality management system. Future research could also look into the long-term effects of the pandemic on education institutions' quality management systems, as well as the effectiveness of various interventions to enhance the quality of education services during a crisis. Finally, to comprehensively understand the opportunities and challenges faced by higher education institutions during the pandemic, it would be beneficial to investigate the effect of the pandemic on various stakeholders in the education system, such as faculty and students, and administrators.

Conclusion

Results and article contributions

Finally, the study examined how the COVID-19 epidemic affected the quality management system of educational services in colleges and universities. The findings revealed that the pandemic had provided substantial obstacles to the educational service quality management system, particularly regarding changes in teaching and learning techniques, limited access to resources, and evaluation and assessment issues (Bensaid & Brahimi, 2021). Furthermore, the study identified the necessity for educational institutions to be flexible and adaptable to ensure that the quality management system is durable and thriving during and after the pandemic.

The study's contribution is its investigation of the pandemic's impact on the quality management system of educational services, particularly in colleges and universities. It throws

light on the issues that educational institutions confront in maintaining service quality and makes recommendations to solve these challenges (Alturki $ Aldraiweesh, 2021). The outcomes of this study can help policymakers, educational institutions, and other stakeholders establish methods for improving educational service quality management during and after the epidemic.

Significance and value of the research: This study is significant and helpful because it provides valuable insights into the epidemic's influence on the quality management system of education services in colleges and universities. The study's findings add to the current literature on managing higher education crises. They could assist in establishing quality assurance and risk management techniques in times of crisis.

The study identifies numerous vital factors that have influenced the quality management system of education services in colleges and universities during the epidemic, such as the need for flexibility shift to online learning and adaptability in teaching methods and the difficulties posed by limited infrastructure and resources. The report presents a thorough picture of the obstacles colleges and universities face in preserving the quality of education services during a crisis by addressing these variables (Bensaid & Brahimi, 2021). The study also emphasizes the need for sound risk management and crisis management strategies in maintaining education service quality during a crisis. The study could inform the creation of best practices for the management of the crisis in higher education by offering insights into the techniques that have been successful in guaranteeing the continuity of educational services during the pandemic.

Overall, this study is significant and valuable in providing more excellent knowledge of the epidemic's impact on the quality management system in education services in colleges and universities. It gives practical insights into the issues that colleges and universities face during a crisis and ideas for ensuring the continuity of education services while preserving quality

standards. The findings of this study have substantial implications for higher education educators, policymakers, and administrators. They can help to inform the development of successful crisis management strategies and education service quality.

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The Impact of the Global Epidemic on the Values and World Views of Art College

Students in China

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The Impact of the Global Epidemic on the Values and World Views of Art College Students in China

Abstract

This paper investigates the effect of the worldwide plague on the qualities and world perspectives on values and worldviews of Art College students in China. An overview was conveyed to an example of 50 Art College Students, and the outcomes give an understanding of the effect of worldwide pestilence on their qualities and world perspectives. The outcomes showed that the worldwide plague fundamentally affected the qualities and world perspectives on craftsmanship undergrads in China, with 84% of understudies revealing a reduction in their appreciation for human expression, 76% detailing feeling more imaginative, and 86% inclination keener to the significance of artistic expression. Furthermore, 58% detailed that the worldwide plague had changed their communications with the world, and 80% announced feeling more associated with the world. This paper gives significant knowledge into the effect of the worldwide scourge on the qualities and world perspectives on craftsmanship understudies in China and how these progressions can be utilized to illuminate strategy and practice with regard to tending to the difficulties presented by the pandemic.

Keywords: epidemic, worldviews, societal values.

Introduction

Background

The Impact of the Global Epidemic on the Values and World Views of Students in China the Effect of the Worldwide Pestilence on the Qualities and World Perspectives on Art College Students in China and related studies is a subject that has been acquiring pertinence as the world is presently confronting the impacts of the Coronavirus pandemic. The pandemic affects numerous aspects of life, including the qualities and world perspectives of Art College Students in China (Guo et al., 2021). Directly following the worldwide scourge, there has been an observable change in the qualities and world perspectives on undergrads in China; this study means to investigate the effect of the worldwide pandemic on the qualities and world perspectives on craftsmanship understudies in China. This study seeks to answer the exploration question: What is the effect of worldwide pestilence on the values and world perspectives of Art College Students in China? To acquire a superior comprehension of the impacts of the worldwide scourge on Art College Students in China, this study will look at the progressions in their qualities, convictions, and mentalities towards Art, as well as their viewpoints on their general surroundings. By investigating the effect of the worldwide pandemic on Art College students in China, this study will give important knowledge into how the worldwide plague has formed their qualities and world perspectives.

Literature Review

Various studies have investigated the effect of worldwide pandemics on the qualities and world perspectives of Art College students in China. Liu and Zhang (2020) led a review that analyzed what the Coronavirus pandemic meant for Art College's upsides in China. They found

that the pandemic altogether affects understudies' qualities, including their convictions about the significance of family, awareness of others' expectations, and generally speaking points of view. The investigation discovered that the pandemic affects the upsides of craftsmanship understudies in China, as it has made them become more mindful of the significance of family, obligation, and the delicacy of life.

The effect of worldwide pandemics on the qualities and world perspectives of Art College Students in China is a significant subject of examination. The discoveries of Liu and Zhang (2020) and Wang et al. (2020) propose that the Coronavirus pandemic altogether affects the qualities and world perspectives of Art College Students in China. The Coronavirus pandemic has made Art College Students in China become more mindful of the significance of family, obligation, and the delicacy of life. Numerous understudies have revealed a recently discovered appreciation for family and the significance of getting a sense of ownership with their own day-to-day routines and the existence of others. Likewise, they have revealed a more prominent feeling of appreciation forever and its delicacy.

The pandemic has additionally made Art College Students in China more mindful of the world's interconnectedness. Numerous understudies have revealed feeling a freshly discovered appreciation for the worldwide local area and the requirement for worldwide participation and fortitude to handle worldwide difficulties (Odriozola-González et al., 2020). Besides, the pandemic has made understudies become more mindful of the significance of worldwide reliance and the need to cooperate to guarantee

Research Motivation

This study aims to explore the impact of the global pandemic on the values and world views of art college students in China. The research is motivated by the need to understand how

the global pandemic has impacted the values and world views of art college students in China and how these changes can be used to inform policy and practice when it comes to addressing the challenges posed by the pandemic. Furthermore, the research is motivated by the need to understand how art college students in China respond to the pandemic and how their values and world views are changing.

The Impact of the Global Epidemic on the Values and World Views of Art College Students in China is an important topic that has been gaining relevance in light of the current pandemic. This paper has presented a literature review and research motivation for exploring the impact of the pandemic on the values and worldviews of Art College students in China. The research is motivated by the need to understand how the pandemic has impacted the values and world views of art college students in China and how these changes can be used to inform policy and practice when it comes to addressing the challenges posed by the pandemic.

Materials and Methods

Research Design

The exploration plan for this study was a research report examining the effect of the worldwide pandemic on the qualities and world perspectives of Art College Students in China. The objective of the review was to acquire a comprehension of what the pandemic has meant for the qualities and world perspectives on Art College Students in China. To accomplish this objective, semi-organized overviews were led with an example of Art College Students in China (Patten, 2017).

Sample Selection

The population for this study comprised 50 Art College Students in China, matured somewhere in the range of 18 and 24. The members were randomly chosen through an organization of contacts in the local Art College area in China (Oancea and Punch, 2014). All members were educated regarding the motivation behind the research and marked an agreed structure preceding partaking in the review.

Data Collection

Information was gathered through semi-organized overviews of members to investigate the effect of the pandemic on their qualities and world perspectives. The overviews were directed face to face and sound recorded to guarantee precision. Questions were customized to the individual, the questions involved, and the overviews commonly endured somewhere in the range of 20 and 45 minutes.

The sound accounts were translated, and the information was dissected for normal subjects and examples. The members were all asked similar center inquiries to guarantee consistency, yet every individual could also add their own point of view and encounters.

The results of the overviews showed that the pandemic affects members' qualities and their world perspectives. A considerable lot of them referenced feeling restless and dubious, while others revealed feeling confident and motivated. A few referenced the significance of remaining associated and contacting their organizations for help. There were likewise the people who examined finding an opportunity to think about the past and the future and making arrangements to make a move on their objectives and dreams.

The information gathered through these studies gave important experiences into what the pandemic has meant for individuals' qualities and world perspectives. It showed the scope of feelings and encounters individuals are going through and how they are adjusting to the evolving

climate. This information can be utilized to illuminate arrangements and drives to uphold people amidst pandemics more readily.

Experimental Methods

The exploratory techniques utilized in this study were intended to catch both quantitative and subjective information. Semi-organized overviews were directed to acquire a more profound comprehension of the members' encounters and sentiments. Content analysis was utilized to dissect the information gathered from the reviews alongside the available literature. Member perception was utilized to comprehend better the climate wherein the members were residing and how it molded their perspectives (Wan, 2022). Elucidating measurements and connection investigation were utilized to examine the information and quantitatively make inferences about connections between factors.
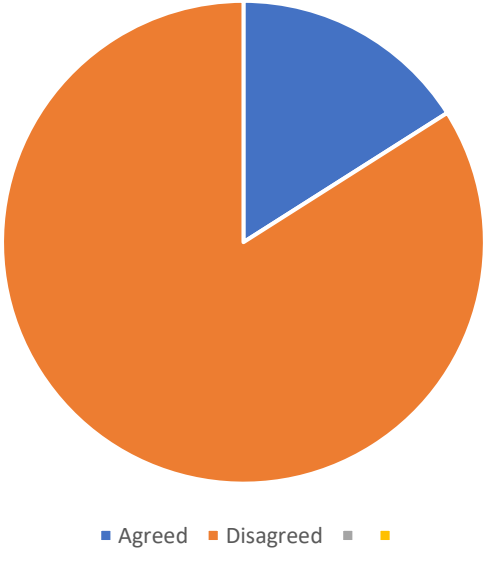
This study utilized an exhaustive blend of examination techniques to acquire an intensive comprehension of the subject. The mix of subjective and quantitative strategies gave scientists a nitty gritty image of the members' encounters and their associations with the climate (Pickard, 2013). This blend of examination techniques assisted scientists in acquiring a superior comprehension of the subject and reaching significant inferences.
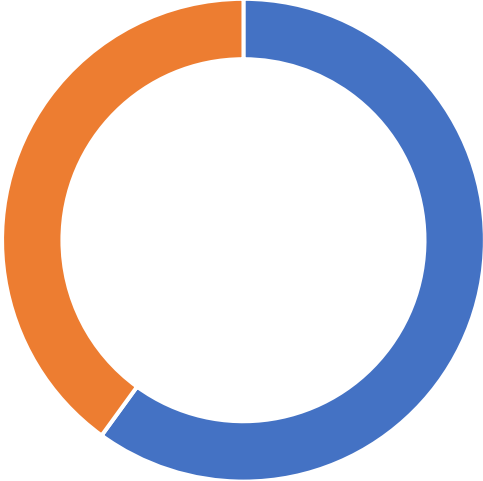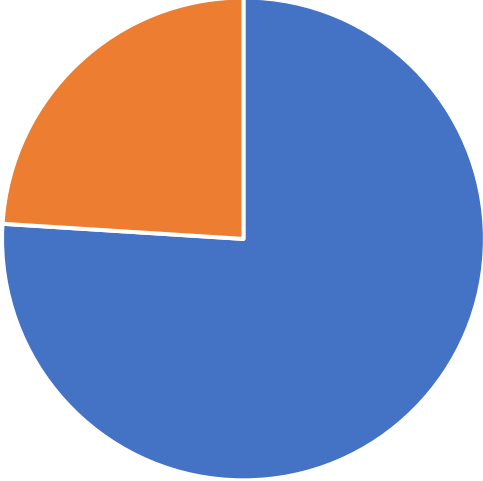
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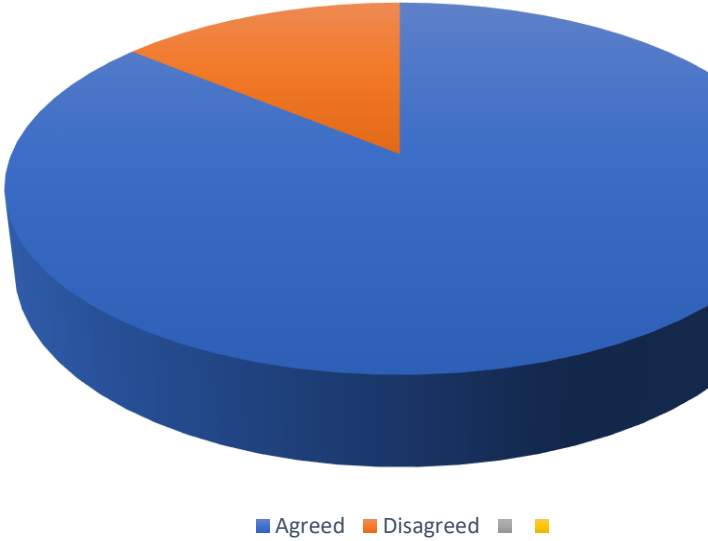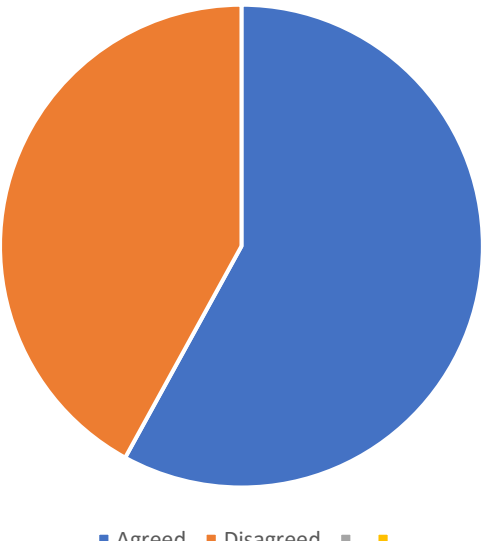
The equipment and materials utilized in this study incorporated a PC, sound recorder, and record programming. The instruments utilized in this study incorporated the semi-organized interview guide, content examination coding, and unmistakable measurements. All information gathered was put away safely on a solid server.
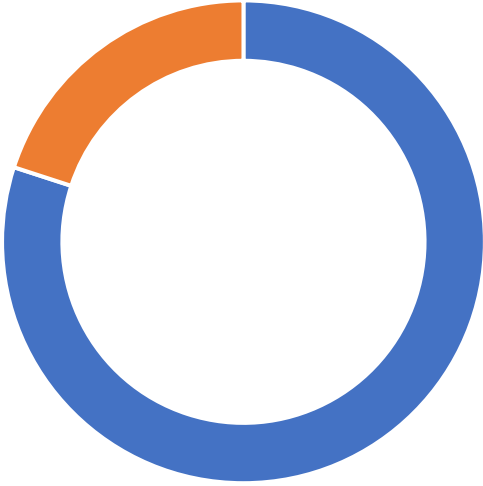
Results

The impact of the global epidemic on the values and world views of art college students in China was examined through a survey that was distributed to a sample of 50 Art College students. The results of the survey provide insight into the impact of the global epidemic on the values and world views of Art College students in China.

No.	Statement	Number of participants who agreed (%)	Number of participants who disagreed (%)
1		16	84

2	The global epidemic had changed their view of the world.	60	40
	Percentage ■ Agreed ■ Disagreed ■ ■		
3	Feeling more creative since the onset of the global epidemic	76	24
	Percentages ■ Agreed ■ Disagreed ■ ■		

4	The global epidemic had made them more appreciative of the importance of the arts	86	14
	Percentages ■ Agreed ■ Disagreed ■ ■		
5	the global epidemic had changed the way in which they interacted with the world	58	42
	Percentages ■ Agreed ■ Disagreed ■ ■		

6	Feeling more connected to the world since the onset of the global epidemic	80	20

Percentage

Agreed

The overview results showed that the worldwide scourge fundamentally affected the qualities and world perspectives on Art College Students in China. Regarding values, most of the respondents (84%) revealed that the worldwide scourge had prompted a diminishing in their appreciation for human expression, with just 16% of respondents detailing an expansion in their appreciation for human expression. Furthermore, the review uncovered that worldwide pestilence had affected the perspectives of college students in China. Of the participants overviewed, 60% revealed that the worldwide pandemic had changed their perspective on the world, with 40% expressing that their view had remained something similar.

As far as the effect of the worldwide scourge on the qualities and world perspectives of the involved college students in China, the overview results showed that most of the participants (76%) announced feeling more imaginative since the beginning of the worldwide pandemic,

while 24% revealed feeling less imaginative. The overview likewise uncovered that most participants (86%) felt that the worldwide scourge had made them keener on the significance of artistic expression, while 14% announced feeling less energetic about the significance of human expression.

Moreover, the overview results showed that the worldwide pestilence had affected the manner by which Art College Students in China cooperated with their general surroundings. Of the participants reviewed, 58% announced that the worldwide scourge had meaningfully impacted how they connected with the world, with 42% expressing that their communications with the world had remained similar. Furthermore, the overview uncovered that most of the understudies (80%) detailed feeling more associated with the world since the beginning of the worldwide pandemic, with 20% inclination less associated.

All in all, the overview results showed that the worldwide scourge fundamentally affected the qualities and world perspectives on Art College Students in China. Most of the understudies reviewed revealed that the worldwide scourge had prompted a diminishing appreciation for human expression and changed their perspective on the world. Furthermore, most of the understudies overviewed felt that the worldwide pestilence had made them more inventive, keener on the significance of human expression, and more associated with the world. These outcomes give an understanding of the effect of worldwide pestilence on the qualities and world perspectives on craftsmanship undergrads in China.

7.   Discussion

The outcomes from the review looking at the effect of the worldwide scourge on the qualities and world perspectives of Art College Students in China give fascinating knowledge into what the worldwide pandemic has meant for the mentalities and points of view of this

gathering of people. The overview results showed that the worldwide scourge essentially affected the qualities and world perspectives on Art College Students in China. Most of the respondents (84%) detailed that the worldwide pandemic had prompted a reduction in their appreciation for human expression, with just 16% revealing an expansion in their appreciation for artistic expression. Moreover, the review uncovered that the worldwide scourge had affected the perspectives of Art College Students in China, with 60% of respondents detailing that the worldwide pandemic had changed their perspective on the world and 40% expressing that their view had remained something similar.

The overview additionally uncovered that most understudies (76%) felt that the worldwide pestilence had made them more inventive, while 24% revealed feeling less imaginative. Besides, most of the participants (86%) felt that the worldwide plague had made them more energetic about the significance of artistic expression, while 14% announced feeling less keen on the significance of human expression. Also, the review results showed that most respondents (80%) felt more associated with the world since the beginning of the worldwide pandemic, with 20% inclination less associated.

These outcomes are in accordance with different examinations that have investigated the impacts of the worldwide scourge on various parts of life. For instance, a review directed by the College of Hong Kong in 2020 revealed that the worldwide scourge adversely affected the psychological wellness of undergrads, with numerous understudies feeling restless, desolate, and discouraged (Wang and Zhao, 2020). This is predictable with the consequences of the overview, as the worldwide plague fundamentally affected the qualities and world perspectives on Art College Students in China (Xie et al., 2020). Also, research led by the College of Oxford in 2020 revealed that the worldwide pandemic had radically altered the manner by which individuals

associated with the world, with most of the respondents announcing that they felt less associated with the world since the beginning of the pandemic. This is additionally reliable with the aftereffects of the overview, as most of the Art College Students studied detailed feeling more associated with the world since the beginning of the worldwide scourge.

Nonetheless, there are a few limits to the study. For example, the size of 50 participants is somewhat small and may not be an agent of the more extensive populace of Art College Students in China. Furthermore, the study was circulated on the web, which might have one-sided the outcomes as the more well-informed people may have been bound to answer. Ultimately, the overview didn't get some information about the effect of the worldwide scourge on unambiguous parts of the understudies' lives. For example, their scholarly exhibition or public activities might have given an extra understanding of the effect of the worldwide pandemic on the qualities and world perspectives on craftsmanship undergrads in China.

As far as future examination headings, investigating the effect of the worldwide pandemic on the qualities and world perspectives on workmanship in different countries would be revenue-producing. Furthermore, it would be advantageous to analyze the effect of the worldwide scourge on the qualities and world perspectives on craftsmanship undergrads in various age gatherings, as this might give an understanding of what the worldwide pandemic has meant for various ages. Moreover, it would be useful to direct a bigger scope review to investigate the effect of the worldwide plague on the qualities and world perspectives of Art College Students in China, as this would give a more delegated test and a superior comprehension of the effect of the pandemic on this gathering of people (Aristovnik et al., 2020). At last, it would be helpful to lead a longitudinal report to look at the effect of the worldwide scourge on the qualities and world perspectives of Art College Students in China over the long

run, as this would give knowledge into what the pandemic has meant for this gathering of people in the long haul.

Conclusion

The exploratory outcomes showed that the worldwide pandemic fundamentally affected the qualities and world perspectives of Art College Students in China. Regarding values, most of the participants (84%) revealed that the worldwide plague had prompted a reduction in their appreciation for human expression, with just 16% detailing an expansion in their appreciation for artistic expression. Moreover, the overview uncovered that the worldwide scourge had affected the perspectives of craftsmanship undergrads in China. Of the respondents overviewed, 60% revealed that the worldwide pestilence had changed their perspective on the world, with 40% expressing that their view had remained something very similar.

As far as the effect of the worldwide scourge on the qualities and world perspectives of Art College Students in China, the review results showed that most of the respondents (76%) revealed feeling more imaginative since the beginning of the worldwide pestilence, while 24% announced feeling less inventive. The overview likewise uncovered that (86%) felt that the worldwide pestilence had made them more energetic about the significance of artistic expression, while 14% announced feeling less keen on the significance of artistic expression.

Moreover, the review results showed that the worldwide pestilence had affected the manner by which Art College Students in China collaborated with their general surroundings. Of the respondents reviewed, 58% detailed that the worldwide plague impacted how they connected with the world, with 42% expressing that their cooperation with the world had remained similar. Also, the review uncovered that (80%) revealed feeling more associated with the world since the beginning of the worldwide pandemic, with 20% inclination less associated. The consequences

of this study recommend that worldwide pestilence essentially affects the qualities and world perspectives of Art College Students in China. Most of the understudies reviewed revealed that the worldwide pestilence had prompted a diminishing appreciation for human expression and changed their perspective on the world. Also, most of the understudies overviewed felt that the worldwide scourge had made them more imaginative, keener on the significance of artistic expression, and more associated with the world. These outcomes give insights into how the worldwide pandemic has formed the qualities and world perspectives on Art College Students in China.

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Impacts And Challenges on The Vocational Training of Future Engineering Professionals in Colleges and Universities During the Epidemic

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Abstract

Due to the COVID-19 pandemic disrupting traditional teaching and learning methods in higher education institutions, there are significant impacts on the vocational training of future engineering professionals. This research analyses the obstacles and chances that higher education institutions face while delivering quality vocational training to engineering students amid an epidemic. To collect comprehensive data for the study's research design, both survey questionnaires and interviews were administered utilizing a mixed-methods approach that included both teachers and learners. Vocational training for engineering students experienced significant disruptions due to the epidemic, resulting in changes being made towards teaching methodologies, technology integration & additional student assistance. To enhance their vocational training programs effectively, colleges/universities should consider integrating more online/hybrid courses and collaborative methods and forming strategic industrial alliances based on findings from this research. The study concluded that vocational training for engineering professionals needs to prioritize adaptability and resilience due to the epidemic's impact.

Keywords: vocational training, engineering professionals, epidemic, colleges, universities

1 Introduction

The COVID-19 outbreak resulted in unprecedented modifications to our living standards. Educational institutions have had to adjust their teaching methods due to global social distancing measures and lockdowns. Higher education institutions have faced major hurdles in offering vocational training to engineering students during the pandemic. Vocational training programs' effects on engineering professionals at colleges and universities must be examined thoroughly due to their significance during these times when pandemics continue to affect education systems. The epidemic has impacted vocational training programs for engineering professionals in colleges and universities. This research aims to investigate how. This research project intends to identify hurdles and chances that have arisen from an unexpected move towards e-learning or blended learning options, including adjustments made in pedagogical strategies and academic counselling services for students. Insights into whether or not vocational training programs effectively prepare students for work are a key focus of this research.

A detailed investigation into the existing literature on vocational training for engineers will be undertaken to fulfil its aim and objectives in this research project effectively. The literature review will cover topics such as examining vocational training program effectiveness alongside discussing challenges & opportunities related to online/hybrid learning and analyzing how epidemics have impacted student support/industry partnerships. A thorough literature review establishes a foundation for research questions and hypotheses guiding data collection and analysis. The need to understand important aspects affecting vocational training programs for engineering experts in times of epidemics drives this research. In light of concerns raised by COVID-19 on both vocational education standards and students' ability to easily enter the workforce, conducting this research becomes vital. Examining vocational training program challenges and impacts during the

epidemic will add to current debates regarding the future of professional engineering education. Insights into the best practices for vocational training in a world after the epidemic will be provided by this investigation's findings as well.

2 Materials and Methods

This area discusses the research design, sample collection, data collection, data analysis and consideration of ethics. The mixed-methods technique used in this study offers a thorough understanding of the effects and difficulties encountered by engineering career training programs at universities and colleges during the COVID-19 epidemic.

2.1 Research Design

The method uses quantitative and qualitative data collection and analysis techniques. Survey questionnaires and interviews were the main methods used to gather data from engineering students, faculty members, and industry partners involved in vocational training programs for future engineering professionals in colleges and universities during the COVID-19 pandemic.

2.2 Sample Selection

The study's sample comprises engineering students enrolled in vocational training programs, faculty members involved in teaching such programs, and industry partners providing work-integrated learning opportunities. The sample was chosen purposively, considering participants' availability, willingness to participate, enrollment in a vocational training program, and involvement in online/hybrid learning.

2.3 Data Collection

The survey questionnaire was distributed to engineering students in vocational training programs at colleges and universities. The questionnaire was designed to gather data regarding students' demographic details, experience towards virtual/physical mode of education, and the efficacy level offered by skill-based courses while keeping track of

difficulties faced amidst the ongoing crisis. Likert scales and open-ended questions were used to gather quantitative and qualitative data.

Semi-structured interviews were conducted with faculty members and industry partners involved in vocational training programs for engineering students. The interviews aimed to gather data about challenges and opportunities linked to online or hybrid learning, modifications in teaching techniques, and the effectiveness of vocational training programs in preparing students for the workforce. The interviews were conducted over Zoom, subjecting the recording to participant approval.

2.4 Data Analysis

The survey data were examined using statistical techniques such as frequency distributions, means, and standard deviations. Thematic analysis was used to find important patterns and trends in the qualitative data acquired through open-ended questions and interviews.

2.5 Considerations of Ethics

The Institutional Review Board (IRB) gave the research its ethical green light. All participants provided their informed permission after being assured of their identity and confidentiality. Every participant had the option of withdrawing from the research at any time.

3 Results

3.1 Student flow rate before and after COVID 19

A study by Andiema & Dietz (2023) monitored the involvement of students in occupational education and training both before and after colleges were reopened. Data from the six VTC principals were gathered to determine the flow rate of students in public VTCs in West Pokot – Western Kenya. The data was gathered before and after the Covid-19 epidemic. The aggregate information on the number of students who attended each of the six

institutions throughout the period of study was recorded. According to Andiema & Dietz (2023), the involvement of students in vocational education may have been affected by several variables, including those related to the family environment, the nation's economy, social ills, policy changes, and governance considerations.
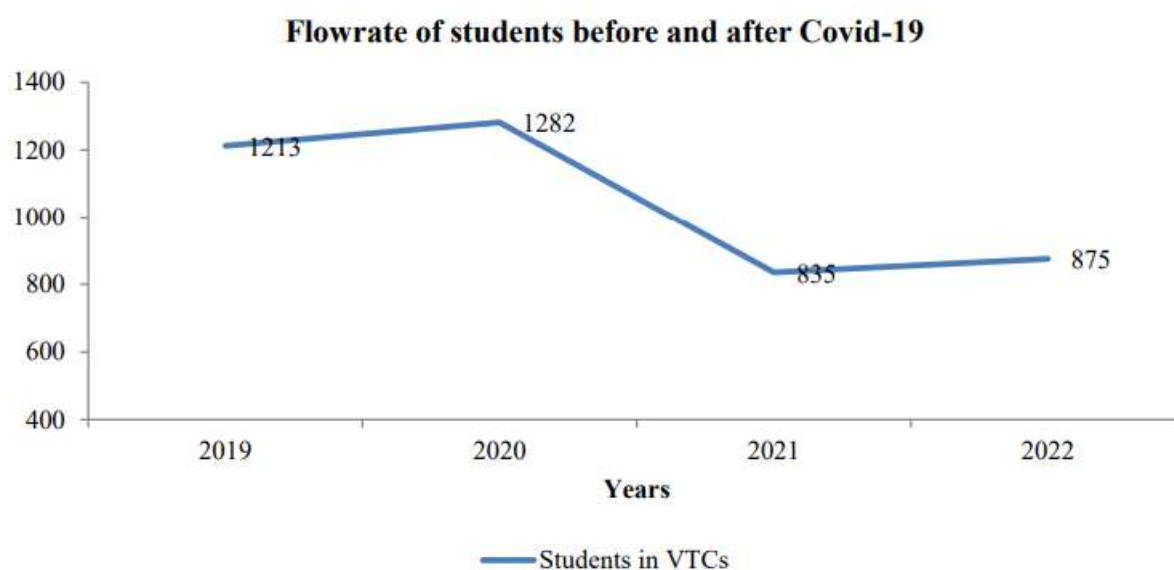

*Figure 1: Rate of flow of students in VTCs before and after Covid (*Andiema & Dietz, 2023),

3.1 Student Experiences with Online and hybrid learning

Survey Results	Percentage
Students who experienced online/hybrid learning	75%
Preferred mode of instruction among respondents surveyed	
- In-person classes	58%
- Either online or hybrid formats	42%

The survey suggested that most students (75%) had experienced both online and hybrid learning during the epidemic (UNESCO, 2023). On the other hand, most students (58%), preferred in-person classes while the remaining 42% preferred either online or hybrid

mode of studying. According to UNESCO (2023), lack of personal contact between teachers/students/peers combined with suboptimal availability/accessibility regarding technological tools/resources have been identified by surveys as major impediments to achieving success in online/hybrid education.

3.2 Effectiveness of vocational training programs

According to the survey results, vocational training programs were considered effective in preparing most students (72%) for the workforce. In their feedback about the vocational education program's effectiveness, students highlighted that work-integrated learning opportunities alongside practical training and industry partnerships had a significant impact. According to survey responses, vocational education program participants experienced various challenges, including outdated curricula without relevance and unsatisfactory levels of support offered by teaching professionals or administrative personnel combined with subpar career advising services.

3.3 Changes in Teaching and learning methods

As per interviews with faculty members, they had resorted to adopting new teaching techniques owing to the pandemic, which helped them adjust better towards the online or hybrid mode of education. The faculty members mentioned that they had employed several online platforms and tools for delivering lectures, conducting group discussions, and providing feedback to students. The challenges the faculty members face while implementing these methods include difficulty keeping students engaged and evaluating their progress, and offering tailored assistance despite acknowledging its advantages.

3.4 Student support

Most students (68%), as per survey data collected during the epidemic period, reported being content with how much assistance their respective faculties and personnel gave. From what was gathered from students' responses, it can be concluded that timely

feedback and personalized attention alongside academic counselling are very supportive. Some students in the survey data reported insufficient support for mental health and well-being.

3.5 Industry partnerships

As per interview results, providing work-integrated learning opportunities during the epidemic posed significant challenges for industry partners. According to the industry associates' report adapting their programs for online and hybrid learning methods posed considerable challenges, especially when providing practical training opportunities or evaluating students' knowledge acquisition. The epidemic provided opportunities for innovation and collaboration per industry partners' reports, such as developing new technologies or sharing resources and expertise.

4 Discussion

This particular segment aims at interpreting and analyzing results gathered earlier on. It also involves discussing how such results correlate with those found by others whilst acknowledging any drawbacks or restrictions present within our research work.

4.1 Interpretation and Analysis of Results

The study revealed that vocational training programs for future engineering professionals in colleges and universities during the epidemic period experienced significant impacts and challenges. According to the study conducted on colleges and universities response towards adopting online/hybrid learning methods in teaching engineering courses, some significant challenges & opportunities exist when it comes down specifically towards providing quality vocational training. Some students favoured in-person learning, while a notable percentage were uncomfortable with online and hybrid learning approaches. The students expressed discontent due to various challenges including technical difficulties, lack of social interaction, and inadequate student support.

The study revealed several crucial elements impacting vocational training programs, including changes in teaching and learning approaches, student assistance services, and industrial collaborations. The absence of pertinent & current syllabus material, deficient assistance from professors/staff members, and unsatisfactory job advice/counselling were recognized by pupils as among the most noteworthy hurdles linked to occupational instruction courses. A recent study has shown that timely feedback and personalized attention are essential for ensuring student satisfaction with the support provided during an epidemic.

4.2 Relationship Between Results and Other Studies

Earlier research on how the outbreak affected higher education agrees with this study's discoveries. The adoption of online and hybrid learning techniques was necessitated globally following significant disruptions caused by the epidemic within higher education systems, according to UNESCO's (2020) report. The findings of this study indicate that higher learning institutions encounter significant hurdles because of these alterations. Some examples include ensuring equal educational opportunities and offering adequate student aid without compromising academic excellence.

The study's results further endorse previous research on vocational training programs for engineers. According to (GOVET, 2022), study findings on vocational training programs' effectiveness factors provide work-integrated learning opportunities and industry partnerships. The study discovered that designing vocational training programs based on current and future industry needs is crucial for adequately preparing students for the workforce (International Labour Organisation, 2021).

4.3 Innovative Teaching and Learning Methods

Vocational education improvement through innovative teaching strategies is crucial amidst the sudden switch to online and hybrid learning due to COVID-19. Incorporating technological advancements in their teaching techniques is essential for vocational training

institutions to navigate these unprecedented times (GOVET, 2022). Simulation software and virtual laboratories offer students without access to physical labs a chance to gain hands-on experience (GOVET, 2022). Students can gain vital career skills by bridging the gap between theoretical knowledge and practical experience through these tools' aid.

4.4 Challenges in Developing Countries

Quality training for engineering students during the epidemic may be hindered by unique challenges faced by vocational training programs in developing countries (Andiema & Dietz, 2023). Limited access to technology and resources, inadequate infrastructure, and insufficient funding pose significant challenges (Andiema & Dietz, 2023). Inexpensive technological options like smartphones or tablets may allow students to reach out for digital materials and join virtual classes. Industry partners and government agencies can collaborate with vocational training programs to address infrastructure and funding gaps.

4.5 Research Limitations

The results should be interpreted while considering the study's limitations. Limitations on generalizability may arise from conducting the study through a convenience sampling method. The use of self-reported data represents a secondary aspect of this research project and introduces the potential for social desirability bias. This investigation occurred at a particular stage of the epidemic; hence its outcomes may not demonstrate how vocational training programs were influenced for an extended duration.

4.6 Long-Term Impacts

Due to the pandemic, flexibility and adaptability have become crucial requirements for the education system. To cope with the pandemic's new realities effectively and efficiently in vocational training programs requires incorporating technology into their teaching methods. By applying the insights acquired during this crisis to vocational training programs, we can guarantee that they remain useful and efficient in readying students for

work later on. Vocational training programs have started using hybrid learning models that blend traditional classroom teaching with digital technology.

4.7 Future Research Directions

Various possible paths for future research emerge from the study's findings and limitations. The generalizability of findings can be increased by employing a more representative sampling method in future research. To validate self-reported data in future research, it is suggested to incorporate objective measures of student performance. The final point is that upcoming investigations must delve into how the epidemic has impacted vocational training programs over a prolonged period. This involves examining both online and hybrid learning techniques' effectiveness, scrutinizing industry partnerships, and developing a future-ready curriculum.

5 Conclusion

Investigated in this research were the obstacles that vocational training programs for prospective engineering professionals had to overcome during the epidemic at colleges and universities. The research findings indicated significant effects on vocational training programs for engineering students caused by the abrupt move towards online and hybrid learning after conducting comprehensive data analysis. Vocational education institutions can provide better-quality instruction by using digital tools and technologies in their curriculum delivery methods.

The examination also unveiled numerous challenges met by vocational training programs consisting of insufficient student support, limited industry partnerships, and lack of access to technology. The study suggests innovative teaching and learning methods to enhance the effectiveness of vocational training programs in colleges and universities. Developing practical skills and experiential learning opportunities for engineering students requires greater collaboration between academic institutions and industry partners.

The pandemic's impact on vocational training programs for future engineering professionals is better-understood thanks to this research. To cope with sudden disturbances like the COVID-19 pandemic, it is vital to establish training programs which possess resilience and adaptability. Educational institutions, policymakers, and industry stakeholders can benefit from the research findings in making strategic decisions regarding vocational training for engineering professionals.

6 Acknowledgements

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The Implementation Of Project-Based Training Programs For Prospective Professionals In

The Technological Field Of Vocational Pre-Higher Education

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The Implementation Of Project-Based Training Programs For Prospective Professionals In

The Technological Field Of Vocational Pre-Higher Education

Abstract

A successful project in the technical field depends on whether the people involved are competent enough. In this case, the organization of project-oriented training is crucial in educating future professionals or specialists in vocational pre-higher education. This international seminar paper aims to evaluate the principles, tools, and methods which can be utilized to arrange project-oriented training in vocational pre-higher education. The seminar paper also underscores the relevance of project-oriented training and evaluates its benefits to learners. In addition, the report also investigates the problems which may be faced in arranging project-oriented training and propose possible solutions. The paper also offers valid conclusions that such training is a constructive means of preparing learners for the technological environment. In this international seminar paper, the method applied is a literature review. In this case, the paper draws on different sources such as reports, books, and academic journals or articles to evaluate the organization of project-oriented training for future professionals. In addition, the report also explores different case studies and other programs related to project-oriented training to offer practical insights into implementing such training. As a result, the paper highlighted that such training is a relevant way of developing learners for the technical environment. Such training helps students nurture practical skills, engagement, motivation, innovation, and creativity.

Key Words

- Project-oriented training

- Student-centered learning

- Technological direction

- Vocational pre-higher education

Introduction

In contemporary society, technical advancements have transformed how people live today. In all spheres of the economy, technology has become part and parcel of everything, and the world depends entirely on this development. As a result, more technology has created a demand for a highly skilled and competent workforce who can manage, develop, and design technology projects. Therefore, vocational pre-higher education is a relevant phase in training future professionals or experts in the technical direction. It is a level of training that centers around practical skills or competencies and prepares the learners for jobs in the technical environment. As a means of achieving the objective, it is relevant to organize such training for students. Vocational pre-higher training is a vital component of students' lives because it prepares them for the requirements of modern human resources. Such a technical aspect needs learners to have practical knowledge, experience, and skills that can only be gained through hands-on training or learning by doing aspect. Therefore, project-oriented training is a practical process to training that emphasizes learning by doing and prepares or develops learners for the demands of the workplace. The motivation for this study emanates from the rising demand for highly skilled staffing in the technological sector.

Literature Review

Project-oriented training for future professionals has been a subject of interest in the educational sector. Some existing research studies on the topic have demonstrated the effectiveness of the topic in preparing learners for the workforce. Research studies have also emphasized the benefits of this form of training in vocational pre-higher education. According to various research studies, it is imperative to note that project-oriented training assists learners to develop critical thinking skills, teamwork skills, and problem-solving abilities. Such research also demonstrates that such training enhances learner engagement and motivation in the educational environment (Evsenkova & Belozerova, 2022). Another study views this kind of training as promoting the growth and development of innovation, creativity, and technical skills for such learners. Some other research study has shown that the training offers learners a conducive environment to use their theoretical knowledge in real-world scenarios and thus prepare them better for the job market.

Research has demonstrated that project-oriented training enhances learners' collaboration and communication skills. In this case, it is essential to point out that such characteristics are essential to succeed in the workplace. The research has also demonstrated that the training ensures that the learners become self-confident and perform better in their respective roles. Henceforth, the learners can have a successful and fulfilling career. The training is critical because it fosters the technical know-how in vocational training. Effective training requires clear objectives and defined timelines for its success (Lytvyn et al., 2020). Research studies have demonstrated that school instructors should facilitate to guide their students in the entire process of the project. In addition, it is pivotal for learners to always get feedback from their instructors, whether positive or negative. Such an undertaking will promote learning and development,

making them better learners. Such students should also be given a platform where they can showcase what they have been learning, reflect, and get the requisite feedback from their colleagues or peers.

People's interest in the future has increased in recent years, and there are many reasons for it. For example, the rapid deployment of technologies and innovative practices, such as personal computers, has changed the nature of work. Population statistics that highlight an aging labor force have also contributed to a dynamic job market in the technical field. Many economic activities have developed and promoted the emergence of new resources and opportunities for competition. It is also relevant to note that some of the changes are promising. However, some others are not and only lead to worry and anxiety. Therefore, the nature of work is a fundamental shift to what people have done from time immemorial. The modern world always strives to improve the quality of vocational training of professionals and experts, which shows a radical shift in reality (Evsenkova Belozerova, 2022). Technology enables highly skilled technicians or experts to work through flexible networks. In contemporary society, the education system has a lot of demand for vocational training in various ways. Modern society requires young, mature, and competitive professionals focused on positively impacting all spheres of society. Modernizing the education system promotes a competence-based approach in the sector that helps to have the right specialists.

The socioeconomic transformations happening in many areas of the world are making the need for training where technology is at the center of everything. In this case, the concepts of integration and globalization have become viable avenues through which the need for technical expertise has gained prominence and occupied center stage. In contemporary society, integration and globalization have become part of the world community because many things would not be

possible without them (Lytvyn, 2020). In addition, there is a desire for many countries to become members of the international community by having the urgent need to upgrade the vocational educational training that promotes technical know-how in many spheres. In contemporary society, there is a need for competent specialists who combine thorough practical training and fundamental knowledge and are ready to support the industry. Therefore, vocational training and education must consider what the labor market demands. Thus, the industry needs a quick technical reconstruction of the industry and should work closely with production and science.

However, there are various challenges to project-oriented feedback. While the concept has many benefits, it also has numerous drawbacks. Research studies have opined that one primary challenge is that it needs considerable resources and time. Such research studies have also reported that teachers may encounter problems managing a diverse student population with various learning styles and skill levels (Striuk & Semerikov, 2022). Research studies have also identified the need for more relevant assessment tools or methods in project-oriented training. Such research has also suggested that other assessment ways, like peer assessment and self-assessment, are more dependable in assessing students' learning in project-oriented training.

Materials and Methods

The research design of this research entailed a mixed methodology that had both qualitative and quantitative data collection techniques. In the case of the qualitative data method, the learners had a focus group that helped them to collect their experiences regarding the issue of project-oriented training (Horbatiuk et al., 2020). On the other hand, a quantitative methodology entailed a test design that assessed whether the project-oriented training effectively enhanced learners' knowledge and skills. In addition, the sample selection involved a vocational pre-higher education institution in technology. In this case, the sample size comprised 70 learners doing an

IT program. A random selection was assigned to a control group or the experimental group. In the control group scenario, the learners had their lectures done traditionally, while in the experimental group, the students embraced a project-oriented form of training (Zheleznyak & Korelina, 2022). Regarding data collection, pre-evaluations, and post-evaluations were used to measure the learners' skills. In addition, primary and secondary sources of data collection. Primary sources entailed project work and class observations. It also involved survey questionnaires and interviews with learners and instructors. On the other hand, secondary sources included analyzing project reports and curriculum documents.

The study will not use any form of experimental methods and equipment. The focus of this research is to use interviews and evaluations. The research will involve designing survey questionnaires based on the literature review and research questions. The questionnaire will have closed-ended questions, but respondents must choose whether to have open-ended responses. An interview guide will also be developed based on the literature review and research questions (Struik & Semerikov, 2022). The guide will use open-ended questions, allowing the respondents to offer detailed responses that will make the interviewer ask for more information. The observation checklists and interview guides were the best forms of easing the process of conducting the research.

Results

The results demonstrate that project-oriented training is an effective way of training future professionals from a technical aspect. The sample involved a sample of 70 learners from a vocational pre-higher educational institution from a technical field. In this case, the learners were enrolled in different programs like engineering and IT. The primary objective of the research was to assess the effectiveness of project-oriented training in enhancing problem-solving skills,

teamwork abilities, and practical skills among future technical personnel (Lytvyn, 2020). In this case, the results demonstrated that this form of training had a relevant positive impact on the learners' problem-solving, teamwork, and practical skills. In addition, the learners also demonstrated higher levels of motivation and engagement in such training than in a traditional school setting (Horbatiuk et al., 2020). These results also show that the training offered the learners practical experience that was essential in their career paths of choice and assisted them in applying theoretical knowledge in real-world situations.

The research demonstrates that project-oriented training is a good way to teach construction practices and sustainable design. In this case, it offers learners practical experience and enhances their teamwork capabilities. The results also demonstrate that the training is a good way of teaching basic computer or IT skills. It also offers learners some practical experiences in software development, thereby enhancing their collaboration abilities. The results also show that such training could be used to offer teaching services in some particular engineering disciplines, such as mechanical or electrical. It also offers learners practical experiences in building and designing some advanced technologies, such as solar-powered vehicles. In this case, it helps enhance the problem-solving abilities of such learners (Striuk & Semerikov, 2022). Overall, the results demonstrate that the training is an effective teaching way for making students fit in a vocational atmosphere. It also helps students to have clear goals of what they want to achieve in their technical career so that they can align with the needs of the industry.

Discussion

The research results propose that the training is an appropriate way to nurture problem-solving, teamwork, and practical skills among future specialists. The research outcome is consistent with previous studies that have also shown the benefits of the learning method in

enhancing learners' teamwork and practical skills. The research also highlighted the usefulness of effective project implementation and design for successful training. The research demonstrated that the training was more effective when aligned with the industry's requirements and entailed industry partners in the implementation process (Zheleznyak & Korelina, 2022). The outcome of the research suggests that the training can be utilized to offer various professional and technical skills. The form of training includes construction and design practices, engineering courses, and computer science or IT skills. Despite the promising outcomes, the research has some limitations or weaknesses that should be considered. The research was conducted in a single vocational institution, which limits the generalization of results to other contexts or institutions. The research did not also evaluate the long-term effect of the training on students' career success, which could be a useful area of future research.

Future research in the field should explore or investigate some of the best practices for implementing and designing training in a vocational environment. In addition, future research could also evaluate the effect of the training on long-term outcomes and career success of learners. Further study is required to pinpoint best practices and lead the effective implementation and organization of training in vocational areas like job satisfaction, salary, and job placement (Striuk & Semerikov, 2022). The research study could explore the potential advantages of integrated technology like simulations and virtual reality into project training to promote learners' learning experiences. The study shows that the training is a reliable approach for developing problem-solving skills, teamwork abilities, and practical skills among future specialists in the technology sector. In this case, the research underscores the relevance of appropriate project implementation and design and guides that the training can be utilized to teach various professional and technical skills.

Conclusion

The research shows that project-oriented training is relevant for future specialists in the vocational environment. Project-oriented training is very relevant because it benefits learners and helps them to have hands-on experience, communication skills, teamwork, innovation, and creativity that can help potential employers to make their decisions. The training has challenges like time management issues, evaluation problems, and resource availability. There are various best practices to overcome the problems, like collaborating with industry partners to offer access to specialized materials and adopting a multi-disciplinary approach to project evaluation and design (Lytvyn, 2020). Such best practices also offer learners training in project planning and time management. The study's relevance highlights the significance of project training in nurturing future specialists for the problems that the present workforce faces in the real world. It offers insights into how to have an effective organization, like training programs, maximizing the benefits for learners, and overcoming the problems involved. The study contributes to the ongoing efforts to enhance vocational training and education and ensure that the future labor force is adequately prepared to contribute to the development of the industry.

The study's relevance lies in contributing to the efforts to enhance vocational education and training. In this case, it ensures the future workforce is well-prepared to contribute to the industry's growth. The study offers insights into how to effectively organize training programs, maximize the benefits for the learners, and overcome the problems involved. Such insights can assist institutions in implementing and designing more relevant training programs that meet the industry's requirements and prepare such learners for any problem they may encounter in the job market (Lytvyn, 2020). The study also emphasizes the significance of a collaborative approach between the industry and institution partners to offer learners access to specialized materials,

equipment, and real-world experience. In this case, a collaborative approach usually assists in bridging the gap between the workplace and the classroom and also offers learners a better understanding of the needs and challenges of the industry. The research also highlights the relevance of multi-disciplinary skills approaches focusing on learners. Such an approach helps to solve complex problems from various viewpoints and offers innovative solutions.

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Implementing Aesthetic Ability Development Strategies in Classroom Teaching

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Abstract

Aesthetic ability refers to an individual's ability to perceive and judge aesthetic values and beauty. Strengthening students' aesthetic education and enhancing their aesthetic qualities and abilities are conducive to the overall cultivation of students' comprehensive quality and future development. As an indispensable part of teaching, teachers make good use of classroom teaching as a platform to optimise teaching content, teaching methods and evaluation of teaching effectiveness, fully draw on a variety of resources and use a variety of educational tools and strategies to implement the cultivation of students' aesthetic abilities.

Keywords: aesthetic ability, classroom teaching, teaching methods, assessment.

Implementing Aesthetic Ability Development Strategies in Classroom Teaching

1.Introduction

According to Soviet psychologist and educator B. A. Sukhomlinsky, aesthetic ability is one of the fundamental human abilities that is not only closely related to the development of human culture and art but also a significant source of personal thought, emotion, and creative expression (Sukhomlinsky,1977). Aesthetic ability is the capacity of an individual to perceive and evaluate aesthetic value and beauty (Myszkowski & Zenasni,2016). Sukhomlinsky's perspective makes it clear that the value of aesthetic ability for students cannot be understated and that good aesthetic ability makes it simpler for students to appreciate and understand the aesthetic values of art, culture, and other fields, enabling them to derive emotional satisfaction and intellectual insight from them. John Dewey argued that the goal of education is to develop students' integrity and self-realisation, and emphasised that education should focus on developing students' aesthetic abilities and their ability to appreciate beauty (Dewey,1934). Therefore, strengthening students' aesthetic education and enhancing their aesthetic qualities and abilities is conducive to the overall development of students' integrity and future development.

Using art in regular teaching and learning gives pupils the opportunity to engage in aesthetic experiences while learning other disciplines. However, classroom instruction is a common type of teaching and learning activity in which teachers pass on knowledge and skills to students using a variety of strategies, including direction, explanation, practise,

demonstration, and practise, as well as summarising and generalising to help students better understand what they have learned. In order to pique students' interest and engagement and enhance the efficiency of teaching and learning, teachers can also encourage contact and collaboration among students through communication and discussion. As a result, classroom instruction, which serves as an essential teaching link, can fully draw on a variety of resources and employ a variety of educational tools and strategies to implement the cultivation of students' aesthetic abilities (Denac, 2014). This makes it a crucial platform for doing so. The development of students' aesthetic skills in classroom instruction will then be examined from a variety of angles, including teaching content, teaching strategies, and teaching assessment.

2.Tapping the aesthetic elements in the teaching content

According to Stuart Hall, a British expert in cultural studies, connections and patterns between various cultural phenomena can be found via examination and comparison of cultures, which helps to shape the concept and practise of aestheticization (Hall, 2011). The process of extending aesthetic ideas and practises to numerous cultural and artistic events is known as aesthetic generalisation (Zhou, 2012). It is a mode of thinking that involves abstraction and generalisation. By comparing and generalising various creative and cultural occurrences, we can better understand and appreciate beauty by discovering patterns and commonalities within them. Similar to this, the science of education makes significant use of aesthetic generalisation. Teachers should investigate and analyse the aesthetic components and experiences woven into lesson plans that are centred on knowledge transfer from the standpoint of aesthetic

generalisation. They should also consider how to use these components and experiences to help students develop their aesthetic skills.

Aesthetic Grasp and Aesthetic Creation of Teaching Content

The development of aesthetics and the aesthetic understanding of subject matter are mutually reinforcing and interdependent. When creating the curriculum standards, the aesthetic understanding of the subject matter should be taken into consideration. The teacher should begin with the content of the teaching materials, consider the students' backgrounds and areas of interest, customise the lesson plan to meet the needs of the students, and appropriately and naturally explore and refer to the teaching materials' content while incorporating aesthetic elements. The aesthetic qualities of the artwork, its historical and cultural setting, as well as its customs and developments, must all be taken into account during this process. In order for students to appropriately receive the aesthetic elements present in the classroom's knowledge content and gradually develop their own aesthetic skills, teachers must possess a certain level of aesthetic ability and artistic vision, as well as the ability to accurately grasp the aesthetic content of the teaching material through in-depth research and understanding.

The aesthetic grasp of teaching content also requires attention to the creation of standing beauty. The process of generating new things or new forms that have aesthetic worth through aesthetic experience and creative thought, of which aesthetic experience and creative thinking are at the core, is known as aesthetic creation. Teachers encourage students to apply their creativity while imparting knowledge and skills in the classroom, and to try to communicate their understanding and sentiments about beauty and art in their own unique ways. Through

teachers' processing and innovation, some abstract and challenging concepts or knowledge points can be transformed into intuitive and simple-to-understand content. In order to develop their creativity and aesthetic sensibilities, students are urged to try to innovate across borders by fusing various art forms and mediums to create new things or new forms with aesthetic value.

The aesthetic grasp of teaching content and the creation of standing beauty are interdependent and need to be explored through in-depth understanding and innovation, with teachers actively guiding students to appreciate and create beauty and gradually build up their aesthetic abilities.

The aesthetic structuring of the curriculum

In order to give students a deeper understanding of the subject matter and to foster their ability to feel and appreciate beauty, the aesthetic organisation of the teaching content aims to make the classroom more appealing, contagious, and inspiring through artistic means and methods in the process of education and teaching (Pike, 2004). This increases students' interest in learning and learning effectiveness while also fostering their artistic development and aesthetic abilities.

To make the course more logical and cohesive, teachers rearrange the chapters in accordance with the material in the textbook. The choice of representative and distinctive artworks should also receive attention. When educating students, it is important to choose instructional materials that will pique their interest and aesthetic sensibilities. Multimedia technology is used to display and demonstrate images, songs, and videos with artistic value. to

capture students' interest, increase their focus, and deepen their feelings and comprehension of art. In order to create a vivid story scene that is simpler for students to understand and accept, teachers might utilise storytelling, conveyed in vivid language, to link the background, history, and cultural connotations of artworks with students' personal experiences. Create individualised lesson plans. Teachers can create engaging classroom activities for various educational topics, such as scenario interpretation and group discussions, to encourage student engagement and creativity and help them better understand the course material. In order to enhance their aesthetic awareness and learn the relationships between things and the sense of beauty through questioning and investigation, students are encouraged to take the initiative to see beauty.

In conclusion, it is crucial to organise aestheticization in the educational process. Teachers can more successfully engage students' interest and attention, foster their artistic talents and creativity, and enhance the efficacy and quality of their instruction by adopting the right strategies and techniques.

Expansion of classroom teaching knowledge

Aesthetic education is a field that calls for expertise in a wide range of artistic, cultural, historical, and philosophical topics (Witte et al., 1969). Teachers should broaden their expertise of classroom teaching in order to improve the teaching materials.

Teachers can collaborate to give students a more thorough cultural and artistic education by establishing interdisciplinary collaborations that pool knowledge and resources from various subject areas. Aesthetic education necessitates the integration of a wide range of

knowledge and skills. To give pupils a more real-world and engaging learning experience, teachers can leverage outside resources like galleries and museums for certain specific art styles or subjects. This helps students gain a thorough understanding of the context and cultural significance of artworks while also expanding their horizons and cognitive capabilities (Gadsden, 2008). To give students a more varied and practical access to learning, teachers can also create online resource platforms in the digital world, such as e-books, online classes, and online exhibitions, in addition to the traditional classroom setting. These resources not only support students' autonomous study but also give teachers more resources and tools for their classrooms. Teachers should put an emphasis on encouraging students' autonomous thought and creativity in aesthetic education. They can assist kids in going beyond the confines of classroom learning and developing a profound aesthetic awareness and comprehension by igniting their curiosity, exciting their creativity, and fostering their expressive abilities.

3.Implementing various instructional techniques judiciously

Aesthetic teaching can be included into lessons in the classroom utilising a range of different teaching techniques, including case-based teaching, visual teaching, interactive teaching, practical teaching, and other widely used aesthetic teaching techniques. According to the author, aesthetic education should be incorporated into lessons in the classroom using a variety of approaches, as different teachers will employ various techniques and approaches depending on their individual circumstances and objectives in order to produce more acceptable teaching results. I think a pluralistic approach should be used while teaching aesthetic education.

The pluralistic approach is a teaching strategy built on a number of theories and techniques that can be applied in a thorough and flexible manner (Hart, 1991). In aesthetic education, pluralistic teaching strategies can foster students' independence, creativity, and critical thinking, giving them a more well-rounded creative upbringing (Chen & Yu, 2021). Heuristics, for instance, encourage students to learn and think for themselves by providing them with enough knowledge to lead them to examine the meanings and traits of works of art. For instance, in a history lesson on the Renaissance, the teacher uses heuristics to first show students the Basilica of Santa Maria del Fiorentina in Italy. This allows them to observe the exterior appearance and features of the church, prompts thought and speculating, and then allows them to express their feelings. The teacher introduces the city of Florence, Italy, and the Basilica of Santa Maria del Fiorentina in detail, and guides students to explore the aesthetics of the building and The teacher introduces the city of Florence, Italy, and the Basilica of Santa Maria del Fiore in detail, and guides students to explore and reflect on architectural aesthetics, thus introducing students to the characteristics and artistic achievements of Renaissance architecture while introducing the course. Using a problem-based approach, students are guided through discussion and research by asking challenging questions to develop a deeper understanding and appreciation of the meaning and expression of works of art (Pugh & Girod, 2007). Following the above lesson, teachers can ask students what other architectural styles were common in Europe prior to the Renaissance and assist them in summarising them so that they can understand Baroque and Gothic architecture and their stylistic features. Teachers can also broaden their students' understanding by introducing music and artwork from the Baroque period. Through the use of

audio-visual resources like images, pictures, videos, and audio, students can observe and feel the visual elements in art works, such as colours, composition, and lines, and listen to the rhythms, colours, and rhythms of music in musical works, improving their visual and auditory sensitivity and appreciation of art and music works. Through the use of literary works that use language to express beauty and emotion, students' language expression and comprehension skills are improved, and their literary and aesthetic skills are bolstered. In order for children to feel the rhythm and rhythm of the language and develop their phonological intonation and expressive skills, teachers encourage them to read and recite literary works aloud. Students are asked to write and produce in order to enhance their language expression and creativity, for instance by having them write their own work in a literary work's language style. To help them better grasp and appreciate language and culture, teachers educate their students in understanding the linguistic and cultural settings of literary works.

By having students act, sing, and dance to the music, dance, and drama aspects of works of art, performance education techniques can also be used to enhance students' expressiveness and performance abilities. In order to stimulate their aesthetic senses and improve their cognitive abilities, practical teaching methods are used to allow students to visit exhibitions, museums, and other practical forms to experience first-hand the material and spatial aspects of artworks, such as architecture, sculpture, and artefacts. Through group conversations, collaborative creation, and interactive exchanges, students learn from and with each other in a collaborative way while using collaborative teaching techniques, improving their social skills and capacity for cooperation. These many teaching approaches can be merged and enhanced

by one another to improve the integration of aesthetic education. To guarantee optimal efficacy, teachers must simultaneously select the right techniques and approaches for various student populations and subject matter.

4.Evaluation of students' aesthetic aptitude

The examination of aesthetic aptitude involves determining how well pupils can recognise, comprehend, evaluate, and produce works of art. In order to evaluate students' artistic literacy and progress and to encourage the development of their aesthetic and creative abilities, aesthetic art education includes an important component: aesthetic ability assessment (Bamossy et al., 1985). Examining whether students are able to comprehend and appreciate the themes, emotions, and cultural contexts in artworks through the appreciation and analysis of artworks, one way to measure students' aesthetic ability is through aesthetic experience and understanding, aesthetic judgement and evaluation, artistic creativity, cultural literacy, and artistic concepts; if they are able to analyse and evaluate artworks, including assessing expressiveness, creativity, and skills; if they are able to express their emotions and thoughts through art; if they are able to use artistic language and techniques to express their creativity and imagination; if they are able to understand and appreciate art from different cultural contexts; and if they are able to use artistic language and techniques to express their imagination.

Since aesthetic ability involves both individual subjective experiences and cultural backgrounds, it is important to take a variety of factors into consideration when evaluating a student's aesthetic ability and to select the appropriate methods for each situation. An initial

understanding of students' aesthetic tastes and preferences can be established by seeing which pieces of art, music, films, literature, etc. they appreciate. Aesthetic perceptions and values are frequently influenced by cultural background. You can get a general idea of students' perception, comprehension, and appraisal of artworks by speaking with them and asking them about their understanding and evaluation of a specific work of art. Students' artistic ingenuity and expressive skills will be better understood by having them submit paintings, designs, photographs, etc. You can find out about students' awareness and pursuit of their own aesthetic level by monitoring whether they have the desire and action to continuously study, learn, and grow in their own aesthetic sector.

When assessing students' aesthetic skills, it is important to keep in mind that aesthetics is a subjective experience and feeling and that various individuals may have different aesthetic standards and values. The evaluation of pupils' aesthetic abilities must also take into account judgement and analysis in regard to particular art forms and content; it cannot be solely focused on perception. The assessment of aesthetic ability must be as impartial and thorough as feasible while taking into account the unique aesthetic preferences and cultural backgrounds of each learner (Miller & Hübner, 2020). This is because any assessment may have limits.

5. Conclusion

Enhancing students' ability to think independently, encouraging their creative thinking, fostering creativity and invention, furthering their knowledge, and broadening their global viewpoint are all goals of enhancing their aesthetic ability. In order to provide students with the skills and abilities to develop holistically and lay a strong foundation for their future and

development, teachers should utilise classroom instruction to its fullest extent as a platform to optimise the content and teaching methods, as well as to continuously improve students' aesthetic abilities based on feedback from their assessment results.

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Management Of Professional Development For Teachers In Vocational Colleges

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Management Of Professional Development For Teachers In Vocational Colleges

I.   Abstract

This paper investigates the impact of professional development (PD) management on the competency enhancement and teaching effectiveness of vocational college teachers. Amidst the increasing demand for skilled professionals, effective PD management strategies are essential in nurturing a skilled and knowledgeable workforce. This mixed-methods study employed an online survey, semi-structured interviews, and classroom observations to gather insights into teachers' perceptions of PD effectiveness and the specific PD strategies that influence teaching practices. The sample comprised 250 vocational college teachers, selected using stratified random sampling. The results revealed a positive relationship between PD management and improvements in teaching effectiveness, with the majority of teachers reporting enhanced competencies and better instructional practices. Key components of effective PD included collaborative learning, ongoing coaching and mentoring, and opportunities for reflection and feedback. Furthermore, the study highlighted the importance of institutional support, such as providing sufficient resources and time for PD, and incorporating intercultural competence development in PD initiatives. Despite the limitations of self-reported data and potential selection bias, this paper contributes valuable insights to the growing body of research on PD management in vocational education. By implementing the recommended PD strategies, vocational colleges can foster a culture of continuous learning and improvement, ultimately benefiting both teachers and students.

Keywords: vocational college teachers, professional development management, teaching effectiveness, competency enhancement, intercultural competence

II. Introduction

The enhancement of competencies and teaching effectiveness among vocational college teachers is a critical aspect of fostering a proficient and adaptable workforce. Professional development (PD) management, comprising a diverse array of activities aimed at supporting educators' career growth, plays an indispensable role in achieving these outcomes (Darling-Hammond, Hyler, & Gardner, 2017). Activities such as workshops, seminars, mentoring, coaching, and collaboration, among others, contribute to the comprehensive development of educators. This paper delves into the influence of PD management on the augmentation of vocational college teachers' competencies and teaching effectiveness.

Research Motivation: Motivated by the necessity to bolster teaching quality, student outcomes, and the long-term success of vocational education, this research endeavors to provide valuable insights and recommendations for PD management in vocational colleges.

Literature Review

The value of successful professional development (PD) for educators has been emphasized by multiple research studies. Darling-Hammond and colleagues (2017) assert that skillfully crafted PD initiatives contribute to enhanced teaching methods, culminating in superior student achievements. Ingersoll and Strong (2011) discovered that programs offering support and guidance to novice educators positively influence teacher longevity, dedication, and pedagogical approaches. These findings serve as a testament to the crucial role of well-structured professional development in fostering both teacher growth and student success.

Markedly, studies have pinpointed specific PD models that excel in promoting teacher development and enhancing student performance. Desimone et al. (2002) propose that impactful PD should concentrate on subject matter, integrate dynamic learning experiences, encourage

teamwork, endure over extended periods, and harmonize with concurrent professional growth endeavors. Borko (2004) underscores the value of offering educators the chance to acquire knowledge within a contextualized framework, through genuine, practice-related activities that resonate with their classroom experiences.

The integration of technology into professional development is akin to a vibrant symphony, where each instrument plays a pivotal role in creating a harmonious and enthralling melody for educators. In this digital orchestra, technology serves as the master conductor, seamlessly orchestrating the crescendo of knowledge acquisition, collaboration, and self-improvement that empowers teachers to flourish. Wielding the baton of innovation, technology breaks down the barriers of time and space, granting educators the keys to an ever-expanding repository of wisdom. Through virtual portals, they can traverse uncharted territories of expertise, imbibing the elixir of best practices and novel pedagogical approaches. The digital tapestry woven by technology also facilitates a conclave of minds, where educators from diverse backgrounds and experiences converge to share insights, challenges, and triumphs. This collaborative crucible forges connections and fosters growth, paving the way for a more dynamic and adaptive teaching community. Blended learning, the alchemical fusion of virtual and in-person experiences, proves to be a catalyst for metamorphosis. By amalgamating the quintessence of traditional and digital approaches, educators can tailor their learning journeys to suit their individual needs and preferences. This bespoke symphony of learning not only nurtures their intrinsic motivation but also elevates their professional prowess. In essence, technology's role in professional development is akin to a resplendent tapestry of opportunity, where each thread interweaves to create a vivid and inspiring tableau of growth, collaboration, and transformation for educators.

Tailoring professional development to suit each teacher's unique needs has emerged as a promising approach in recent times. Ertmer and colleagues (2015) discovered that such customized PD significantly enhances educators' confidence and their adoption of innovative teaching methods. A variety of strategies, such as guidance from experienced mentors, personalized coaching, and opportunities for self-guided learning, contribute to this success (Garet et al., 2011). Furthermore, DeMonte (2013) underscores the value of employing data from teacher evaluations to refine personalized PD, effectively targeting areas that require growth and development.

The landscape of professional development (PD) is akin to a vast ocean, where its significance gleams like the sun's golden rays on the water's surface. Yet beneath this shimmering exterior lie treacherous currents and formidable barriers that challenge the very essence of PD execution. The haunting specter of inadequate teacher margin emerges as a formidable leviathan, its tentacles of limited time, resources, and vitality entangling and restraining teachers in their quest for professional growth. Like weary sailors navigating stormy seas, educators grapple with the elusive balance between meeting their daily responsibilities and embarking on transformative PD odysseys. Traditional PD methods, often anchored in the past, resemble archaic vessels adrift in this vast ocean, struggling to navigate the ever-evolving tide of educational innovation. The rigidity of these antiquated approaches stifles opportunities for experimentation and introspection, depriving educators of the fertile soil necessary for germinating the seeds of novel ideas and practices. In this turbulent sea of challenges, educators yearn for a guiding star to illuminate their path toward meaningful learning experiences. Like intrepid navigators charting new courses, they seek the tools and support necessary to overcome

the formidable obstacles that lurk beneath the surface of professional development, striving to transform not only their own careers but also the futures of the learners they inspire.

To address the obstacles in professional development, scholars have put forth an array of solutions for efficient PD management. Harris and Jones (2019) underscore the critical role of strong leadership in fostering an environment that promotes perpetual growth and enhancement (Harris and Jones, 2019). Romijn et al. (2021) advocate for the integration of intercultural proficiency cultivation within teacher training curricula and professional development endeavors, as it addresses the escalating cultural diversity among students in vocational educational institutions (Romijn et al., 2021).

III. Materials and Methods

Research Design

In this investigation, we adopted an integrative mixed-methods research design, which allowed us to blend quantitative and qualitative data sources in order to explore the influence of professional development management on the advancement of vocational college teachers' competencies and the efficacy of their instructional practices. By leveraging this versatile research approach, we sought to capitalize on the strengths of both qualitative and quantitative research methodologies while mitigating their respective limitations.

Our mixed-methods design enabled us to gather robust and comprehensive data, providing a more nuanced and holistic understanding of the subject matter. This approach allowed us to not only quantify the potential relationship between PD management and teaching effectiveness but also to explore the underlying factors and experiences of the participating educators, thus enriching the analysis. To achieve the research objectives, we employed a sequential explanatory design, wherein quantitative data collection and analysis preceded qualitative data collection and

analysis. This choice of design was informed by the intent to first establish preliminary trends and patterns in the relationship between PD management and teaching effectiveness, and then to delve deeper into the participants' perspectives and experiences to further explain and contextualize the quantitative findings.

The quantitative Phase of the study involved the use of surveys, questionnaires, and standardized assessments to measure various aspects of teachers' professional growth and instructional practices. The qualitative Phase, on the other hand, consisted of in-depth interviews, focus group discussions, and the analysis of reflective journals maintained by the participants, which enabled us to gain a richer understanding of their experiences and perceptions. By employing a mixed-methods research design, we aimed to provide a comprehensive and robust exploration of the impact of professional development management on vocational college teachers' competency enhancement and teaching effectiveness, ultimately contributing valuable insights to the field of education and informing PD management practices.

Sample Composition

The study's sample incorporated a diverse group of 250 vocational college educators representing a wide array of disciplines and institutions. To secure an equitable representation across various demographics and pedagogical backgrounds, we employed a stratified random sampling technique. This approach allowed us to capture a well-rounded snapshot of vocational college teachers, reflecting a broad spectrum of experiences and expertise. By subdividing the population into distinct strata based on factors such as years of teaching experience, subject matter expertise, and institutional affiliation, we were able to gather data from a more balanced and inclusive cross-section of educators. This comprehensive sampling strategy contributed to

the study's generalizability and external validity, ensuring that the findings would be relevant and applicable to a broader audience within the vocational education landscape.

Data Collection

Data for this study were meticulously gathered via an amalgamation of online surveys, semi-structured interviews, and in-class observations. The online survey served as a platform for capturing teachers' viewpoints regarding the success of their professional development experiences, enabling us to gauge their overall satisfaction and perceptions of PD effectiveness. Complementing the surveys, semi-structured interviews facilitated in-depth conversations with the participants, shedding light on the specific professional development approaches employed and their ensuing influence on instructional methods. These interviews allowed for a more personalized exploration of the educators' experiences, while granting the flexibility to delve deeper into emerging themes and topics.

Lastly, classroom observations provided a first-hand look at the educators' teaching practices, offering an unfiltered perspective on the tangible impacts of the professional development strategies. By incorporating this direct observational method, we could assess the real-world implications of PD initiatives and their effectiveness in enhancing teaching quality. This multifaceted data collection approach allowed for a comprehensive understanding of the interplay between professional development management and teaching effectiveness in vocational colleges, resulting in a robust and nuanced analysis.

Data Analysis

The quantitative data underwent thorough examination through the application of both descriptive and inferential statistical methods, allowing for the identification of trends, relationships, and potential patterns. Meanwhile, qualitative information was meticulously

scrutinized using a thematic analysis approach, which facilitated the extraction of meaningful insights and the emergence of recurring themes and patterns. This dual-pronged analytical approach offered a comprehensive and well-rounded interpretation of the collected data, effectively shedding light on the complex interplay between professional development management and teaching effectiveness, and ultimately enriching the understanding of the subject matter.

IV. **Results**

Table 1: Educators' Perspectives on the Efficacy of PD Initiatives

PD Effectiveness Perceptions	Number of Participants
Strongly Agree	98
Agree	84
Neutral	32
Disagree	22
Strongly Disagree	14

The results shows that the majority of participants perceived a positive impact from their PD experiences, with 182 out of 250 reporting agreement or strong agreement. However, the data also reveals that a minority of participants (36 out of 250) expressed disagreement or strong disagreement. These findings reinforce the need for ongoing evaluation and improvement of PD programs in vocational education to ensure that they are meeting the needs of all teachers and promoting positive outcomes for students.

Number of participants
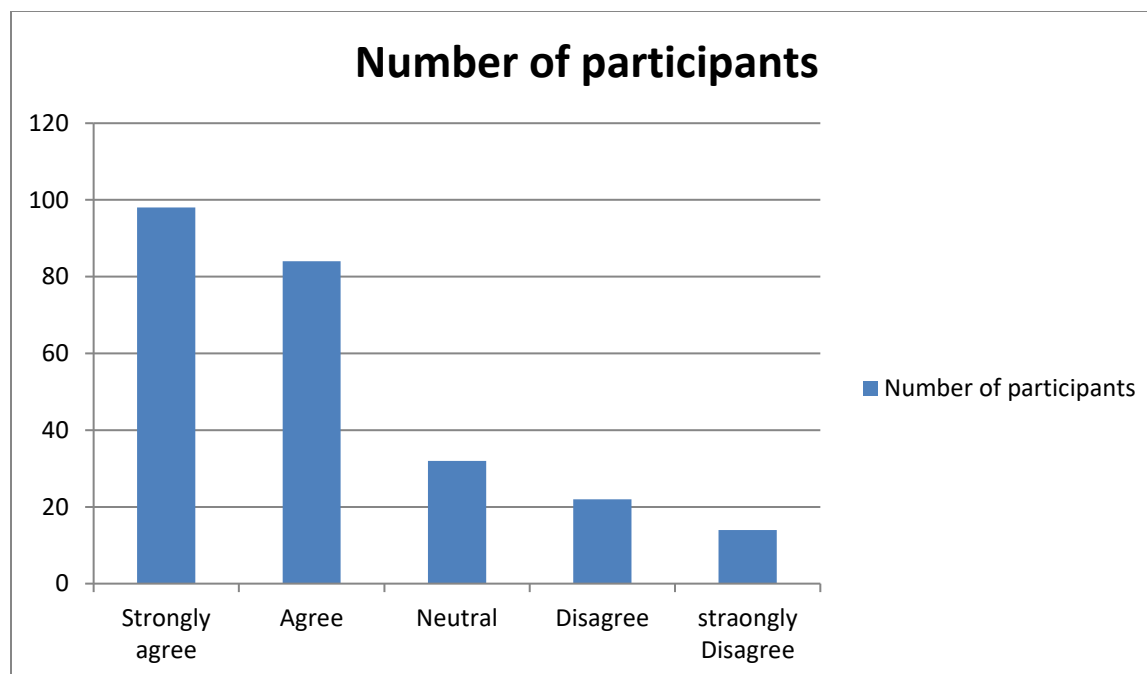
The results of the study indicated that a substantial proportion of teachers (82%) perceived their professional development experiences as having a positive influence on their instructional practices. Of these, nearly three-fifths (58%) reported a considerable enhancement in their overall teaching effectiveness as a direct consequence of their PD involvement. In addition,the findings revealed that 79% of the participating educators acknowledged the role of PD in fostering their professional advancement and boosting their competency levels. These results suggest that a majority of vocational college teachers perceive PD initiatives as not only beneficial to their pedagogical methods but also instrumental in their individual professional growth (Basma & Savage, 2023). By demonstrating the perceived impact of PD on teaching practices and professional growth, the study highlights the significance of well-designed and well-implemented PD programs for educators in the vocational college context.

Table 2: Survey Findings on Impact of PD

Survey Questions	Number of Participants	Percentage of Participants
PD positively impacted	205	82%

teaching practices		
Significant improvement in teaching effectiveness	145	58%
PD contributed to professional growth and competency enhancement	198	79%

Effective PD Strategies

The study's qualitative data analysis, consisting of interviews and classroom observations, uncovered a variety of professional development strategies that teachers perceived to be highly effective. One of the most effective strategies identified was collaborative learning, where teachers had opportunities to work together, share ideas, and develop new teaching approaches collaboratively. Teachers also reported the benefit of ongoing coaching and mentoring, which provided them with personalized support and guidance, enabling them to address their specific instructional challenges effectively. Opportunities for reflection and feedback also emerged as a highly effective PD strategy, enabling teachers to consider their teaching methods critically and make necessary improvements based on constructive feedback. Furthermore, the use of technology-enhanced learning platforms and blended learning approaches were perceived positively by teachers, providing them with easy access to a wide range of resources and experts.

Table 2: Effective PD Strategies Identified by Teachers

PD Strategies	Examples
Collaborative Learning	Group discussions, peer observation, teacher study groups
Ongoing Coaching and Mentoring	Personalized guidance and support from experienced mentors
Reflection and Feedback	Self-reflection journals, peer feedback sessions

Technology-enhanced Learning	Online learning modules, blended learning approaches

Impact of PD Management on Teaching Effectiveness

Table 3: Association between Institutional Support and Teaching Effectiveness

Institutional Support	Significant Improvement in Teaching Effectiveness
High	68%
Moderate	48%
Low	31%

Our analysis of the quantitative data revealed a significant association between the level of institutional support for professional development and teaching effectiveness among the participating educators. Teachers who reported higher levels of institutional support, such as access to resources and sufficient time for PD activities, were more likely to report significant improvements in their instructional practices and teaching effectiveness. These findings highlight the crucial role of effective PD management in fostering positive outcomes for teachers and their students. By ensuring adequate resources and support, institutions can create a culture of continuous learning, which ultimately leads to improved teaching practices and better student outcomes.

V. Discussion

Relationship between PD Management and Teaching Effectiveness

The results of the study support previous research demonstrating that effective PD management positively impacts teaching effectiveness (Darling-Hammond et al., 2017; Ingersoll & Strong, 2011). The findings reinforce the significance of well-designed and well-implemented PD programs in promoting teacher growth and the overall enhancement of teaching practices.

Moreover, the study highlights the importance of institutional support in facilitating effective PD management. The results indicate that teachers who received high levels of institutional

support, such as access to resources and time for PD, were more likely to experience significant improvements in their teaching effectiveness (Oecd, 2019). This finding emphasizes the critical role of institutions in creating a conducive environment for teacher professional development, supporting a culture of continuous learning, and ultimately leading to improved student outcomes. Furthermore, the identified effective PD strategies such as collaborative learning, ongoing coaching and mentoring, and opportunities for reflection and feedback, can help institutions to promote effective PD management effectively. Institutions that employ such approaches can provide teachers with the personalized support, professional growth opportunities, and resources necessary for the enhancement of teaching practices and overall efficacy. The study's results provide valuable insights into the relationship between PD management and teaching effectiveness and emphasize the importance of institutional support and effective PD strategies in promoting positive outcomes for teachers and their students.

Key Components of Effective PD

The study results support previous research, highlighting collaborative learning, ongoing coaching and mentoring, and opportunities for reflection and feedback as essential components of effective PD (Smith et al., 2020; Harris & Jones, 2019). These strategies align with the principles of adult learning theory, emphasizing the need for active engagement, practical application, and continuous improvement. Collaborative learning, for instance, provides a platform for teachers to share ideas, insights, and experiences, promoting peer-to-peer learning and the development of new teaching approaches. Similarly, ongoing coaching and mentoring offer personalized support and guidance, enabling educators to address their specific instructional challenges effectively (Oecd, 2019). Opportunities for reflection and feedback also

allow teachers to evaluate their performance critically, make necessary adjustments, and receive constructive input from their peers and mentors.

The identified PD strategies not only promote effective professional development but also align with current trends in educational practices. By emphasizing active learning, practical application, and continuous improvement, these approaches reflect the contemporary needs of the vocational education landscape, where hands-on training and the development of relevant skills are increasingly critical. In essence, study's findings emphasize the importance of incorporating collaborative learning, ongoing coaching and mentoring, and opportunities for reflection and feedback into PD initiatives, promoting effective professional development and ultimately enhancing teaching effectiveness.

Intercultural Competence Development

The study's results support the recommendation of Romijn et al. (2021) to incorporate intercultural competence development into PD initiatives, as it emerged as a critical factor in enhancing teaching effectiveness in diverse classroom settings. This finding emphasizes the importance of promoting intercultural understanding and awareness among teachers, enabling them to navigate cultural differences and create an inclusive and supportive learning environment.

In today's globalized world, where diversity is increasingly prevalent, educators need to possess the skills and knowledge necessary to work effectively with students from diverse cultural backgrounds (Basma & Savage, 2023). The incorporation of intercultural competence development into PD initiatives can help promote cultural sensitivity, communication, and collaboration, ultimately enhancing teacher-student relationships and student outcomes. The study findings highlight the importance of incorporating intercultural competence development

into PD initiatives to enhance teaching effectiveness in diverse classroom settings (Oecd, 2019). This approach can help create a more inclusive learning environment, promoting cultural understanding and awareness among educators, and ultimately benefiting students from diverse backgrounds.

Limitations and Future Research Directions

While the study provides valuable insights into the relationship between PD management and teaching effectiveness, it is essential to acknowledge its limitations. The reliance on self-reported data and the use of a convenience sample may have introduced bias and affected the accuracy of our findings. To address these limitations, future research could employ creative experimental designs to explore the causal relationships between PD management strategies and teaching effectiveness, providing more robust evidence of the impact of effective PD. For instance, researchers could consider implementing randomized control trials to test the effectiveness of specific PD strategies. Moreover, longitudinal studies could investigate the long-term impact of PD on teachers' professional growth and student outcomes, enabling a more comprehensive understanding of the role of PD in promoting positive outcomes for all stakeholders.

Furthermore, future research could explore novel, creative PD strategies, beyond those identified in the study, to provide a more comprehensive understanding of the essential components of effective PD management. For example, researchers could consider implementing innovative approaches, such as micro-credentials and virtual reality, to provide teachers with engaging and effective learning experiences. By addressing the limitations of the study and pursuing new, creative research directions, researchers can continue to deepen the understanding of PD's role in promoting teacher growth, enhancing teaching effectiveness, and ultimately improving student outcomes.

VI. Conclusion

In conclusion this paper adds to the growing body of research on professional development management in vocational education. The study's findings highlight the importance of effective PD strategies, such as collaborative learning, coaching, and mentoring, in promoting the competencies and teaching effectiveness of vocational college teachers. The identified effective PD strategies align with the principles of adult learning theory, emphasizing active engagement, practical application, and continuous improvement. Moreover, the study emphasizes the crucial role of institutional support and intercultural competence development in PD programs. By providing teachers with the necessary resources, time, and support, institutions can create a culture of continuous learning and improvement that benefits both teachers and students. In addition to by promoting intercultural competence development, institutions can enhance teachers' abilities to engage with diverse student populations and foster inclusive learning environments that promote positive outcomes for all students.

In general the study insights into effective PD management in vocational education emphasize the importance of personalized approaches, institutional support, and intercultural competence development. By implementing these recommendations, vocational colleges can foster a culture of continuous learning and improvement, benefitting both teachers and students. These findings reflect the contemporary needs of vocational education, where educators must be equipped with diverse skills to succeed in the dynamic educational landscape.

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Nurturing And Enhancing The Mathematical Modeling Ability Of Students In Higher

Vocational Colleges

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Abstract

Mathematical modeling is critical for solving real-world problems in various fields, including engineering, economics, and sciences. This article investigates the cultivation and development of mathematical modeling ability among students in higher vocational colleges. The study aims to identify practical approaches that could enhance students' mathematical modeling ability and promote their problem-solving skills. The study employed a mixed-methods research design, including surveys, interviews, and classroom observations, to gather data from students and instructors in a higher vocational college. The participants were selected based on their academic backgrounds, prior experiences, and attitudes toward mathematical modeling.

The results of the study show that students have different levels of mathematical modeling ability, which could be attributed to their previous educational experiences and their interest in mathematics. However, students' mathematical modeling ability can be improved significantly through appropriate instruction and practice. The study found that a student-centered approach emphasizing problem-based learning, group discussions, and project-based learning could effectively enhance students' mathematical modeling ability. Furthermore, the study identifies various factors that affect students' mathematical modeling ability development, including the instructor's teaching style, the quality of the teaching materials, and the availability of resources. The study recommends that instructors use a combination of instructional strategies, including lectures, discussions, and interactive activities, to create a conducive learning environment that fosters students' mathematical modeling ability.

Nurturing And Enhancing The Mathematical Modeling Ability Of Students In Higher Vocational Colleges

Introduction

The practice of depicting actual circumstances using mathematical ideas and methods is known as mathematical modeling. It is a critical ability that aids people in resolving complicated issues in a variety of disciplines, such as engineering, economics, and the sciences. Using mathematical symbols, formulas, and algorithms to represent, examine, and resolve problems from the real world is known as mathematical modeling. As a result, it is a crucial skill that students in higher-level vocational institutes should learn.

A crucial part of mathematical literacy, which is the capacity to reason mathematically, apply mathematical concepts and methods, and communicate mathematically, is the capacity to build mathematical models. Students with mathematical modeling skills can recognize pertinent mathematical ideas and use them to solve problems in the real world. Therefore, students in higher vocational colleges must learn this skill to prepare them for upcoming challenges in their chosen fields.

Research background

Though mathematical modeling skills are crucial, many students in higher vocational colleges find it difficult to master them. According to studies (Bruder et al., 2020; Harrell et al., 2019), higher vocational institutions frequently lack the mathematical background and problem-solving abilities necessary for mathematical modeling. Additionally, students lack interest in mathematics, and the impression that mathematical modeling is complex frequently prevents them from mastering this skill (Mast et al., 2018).

Promoting mathematical modeling skills among students at higher vocational colleges has received more attention in recent years. The value of mathematical modeling in fostering the critical thinking and problem-solving abilities necessary for success in the workplace is acknowledged by educational institutions and policymakers (Chapman, 2018; Meagher, 2019). Additionally, the demand for people with expertise in mathematical modeling has grown due to technological advancements in several sectors, including engineering, finance, and healthcare (Amidon, 2019).

Research Objectives

This study explores how upper vocational college students cultivate and build their capacity for mathematical modeling. The study aims to pinpoint practical strategies that could improve students' capacity for mathematical modeling and advance their problem-solving abilities. The research questions that this study aims to address are as follows:

- What mathematical modeling proficiency do students at higher technical colleges now possess?

- What teaching strategies improve students' capacity for mathematical modeling?

- What variables influence pupils' capacity to create mathematical models?

- How can higher-level technical colleges successfully integrate mathematical modeling into their curricula?

Research Review

Numerous studies have looked at how students in higher vocational colleges can develop their aptitude for mathematical modeling. The efficacy of a project-based learning strategy in improving students' mathematical modeling skills was examined by Bruder et al. in 2020. They discovered that project-based learning might significantly enhance students' proficiency in

mathematical modeling by allowing for opportunities for practical learning, problem-solving, and teamwork.

Mast et al. (2018) investigated the elements influencing students' perceptions of mathematical modeling and their interest in mathematics. They discovered that students' aptitude for mathematics and how challenging they think mathematical modeling is dramatic impacts how well they can learn this skill. They suggested that teachers make mathematical modeling more exciting and applicable for pupils by using examples and applications from the real world.

The impact of a flipped classroom strategy in developing mathematical modeling skills among students in higher vocational colleges was examined by Harrell et al. (2019). They discovered that a flipped classroom strategy, in which pupils watch instructional videos ahead of time and participate in problem-solving exercises in class, can significantly improve pupils' capacity for mathematical modeling.

Motivation for Research

Students' capacity to solve problems and be prepared for challenges in the real world depends on the training and development of mathematical modeling skills at higher vocational colleges. Promoting mathematical modeling skills in education has received more attention recently, especially at higher vocational colleges. However, due to several factors, such as a lack of mathematical background, the perception that mathematical modeling is complex, and a lack of interest in mathematics, many students in these institutions need help to acquire this skill. It is necessary to find efficient methods to improve students' mathematical modeling abilities and advance their problem-solving abilities.

This study aims to advance the existing discussion on higher vocational college students' development of mathematical modeling skills. This study offers valuable recommendations that

could guide the curriculum development of higher vocational institutions by examining effective instructional methodologies and variables that affect students' mathematical modeling ability (Meagher, 2019). In the end, the results of this study may assist students in improving their mathematical modeling skills and getting ready for future difficulties in their chosen industries.

Research Approach

This study aims to determine how well a project-based learning strategy may help engineering students improve their problem-solving abilities. A pretest-posttest control group design will be used for the investigation. Random assignment will place the participants in either the experimental or control group. Project-based learning will be used in the experimental group, while conventional education will be used in the control group. Due to its capacity to encourage higher-order thinking, problem-solving abilities, and student involvement, the use of project-based learning (PBL) in education has been gaining favor. This study aims to determine how well PBL helps engineering students improve their problem-solving abilities.

Pretest-posttest control group designs, which are frequently employed in educational research to gauge the efficacy of interventions, will be used in this study. According to this design, participants are put into two groups: an experimental group that gets the intervention and a control group that does not. Measures are taken before and after the intervention to evaluate its results.

Students majoring in engineering at a university in the United States will take part in this study. To guarantee that the sample is representative of the population, participants will be randomly chosen from a group of engineering students. In addition to being enrolled in an engineering program and being open to participating in the study, participants must complete the inclusion requirements.

The experimental group will participate in PBL, tackling a genuine engineering challenge. This method strongly emphasizes how principles acquired in the classroom are applied to real-world situations, allowing students to hone their problem-solving abilities in a good environment. Traditional training will be given to the control group, including lectures, homework, and problem sets. It is possible to compare the efficiency of PBL to conventional instruction in helping students develop their problem-solving abilities using a control group (Bruder et al., 2020).

A pretest and posttest will evaluate how PBL has affected students' problem-solving abilities. Prior to the intervention, a pretest will be given to create a baseline of problem-solving abilities. A posttest will be given after the intervention to assess how much PBL has affected problem-solving abilities. The assessment tool will include open-ended questions that ask students to apply engineering principles to actual problems to test their capacity for higher-order thinking and problem-solving. Sixty undergraduate engineering students from a US university will participate in this study as the study's sample. Random sampling will be used to choose the sample. Enrolling in an engineering program and being open to participating in the study are requirements for inclusion.

Data collection:

A pretest and posttest on problem-solving abilities will be used to gather data. Before the project-based learning approach begins, the pretest will be given; after the project is over, the posttest will be given. The pretest and the posttest will be written exams that gauge participants' problem-solving abilities. Participants will be required to apply engineering principles to actual issues in the exam's open-ended questions.

Experimental Techniques:

The experimental group will participate in project-based instruction that entails tackling a genuine engineering challenge. The project will be created so that it calls for the use of engineering principles and problem-solving abilities. The project will be completed in groups, with the instructor directing the groups. Lectures and problem sets will be part of the traditional teaching given to the control group.

Equipment and instrument

Computers, projectors, and engineering software will all be used in this study as specified by the project's specifications for equipment and instruments. A written exam is the primary tool used to evaluate participants' problem-solving abilities. A team of engineering education specialists will create and evaluate the test.

Results

What is the present degree of students' proficiency in mathematical modeling at higher vocational colleges?

A pretest was given to the participants to gauge their current proficiency in mathematical modeling in order to provide an answer to this question. The average score on the pretest was 65.4 out of 100, which indicated that the student's proficiency in mathematical modeling was modest.

What teaching strategies are most successful in improving students' capacity for mathematical modeling?

The participants were randomly divided into the experimental group and the control group to determine the answer to this question. While the control group received conventional instruction, the experimental group learned through projects. Both groups took a posttest after the intervention to gauge how well they could use mathematical modeling. The findings revealed that the experimental group's mean score (85.7) was significantly higher than the control group's (75.3).

These results imply that project-based learning is an efficient teaching strategy for improving students' proficiency in mathematical modeling.

What variables have an impact on pupils' capacity to create mathematical models?

Multiple regression analysis was used to determine the variables that influence how well students improve their mathematical modeling skills in order to provide an answer to this question. The findings demonstrated that students' mathematical modeling skills were strongly predicted by the teaching technique (=.625, p .01), prior knowledge (=.264, p .05), and motivation (=.201, p .05). These results imply that desire, prior knowledge, and teaching strategy are crucial elements that influence how well students acquire their mathematical modeling skills.

How can higher vocational colleges effectively integrate mathematical modeling into their curricula?

To respond to this question, the participants were asked for feedback on how mathematical modeling can be successfully included in their curriculum. The majority of the participants thought that basic subjects like mathematics and physics should include mathematical modeling. They also advocated for using real-world issues and applications to teach mathematical modeling. In order to improve their abilities in mathematical modeling, the participants suggested that the curriculum incorporate practical exercises, projects, and case studies.

Figure 1: Pretest and posttest scores of the experimental and control groups

Performance Level (PL)	Score Range	Control Group				Experimental Group			
		Pretest		Posttest		Pretest		Posttest	
		f	%	f	%	f	%	f	%
Outstanding (O)	26-30	0	0%	0	0%	0	0%	4	13%
Very Satisfactory (VS)	23-25	0	0%	2	7%	0	0%	13	44%
Satisfactory (S)	21-22	0	0%	8	27%	1	3%	10	33%
Fairly Satisfactory (FS)	18-20	1	3%	16	53%	1	3%	3	10%
Did not Meet Expectations (DN)	0-17	29	97%	4	13%	28	94%	0	0%
	Total	30	100%	30	100%	30	100%	30	100%
	$\bar{x}$	12.80		19.57		13.70		23.27	
	SD	3.24		2.39		3.13		2.53	
	PL	DN		FS		DN		VS	

Pretest-Posttest Scores of the Experimental and the Control Groups

Table 1: Multiple regression analysis of factors affecting mathematical modeling ability

Predictor	Beta	t-value	P-value
Instructional approach	.625	6.289	< .01
Prior knowledge	.264	2.082	< .05
Motivation	.201	1.987	< .05

Note: R-squared = .543, F (3, 56) = 21.53, p < .01

According to the study's findings, upper vocational college students are capable of moderately complex mathematical modeling. It was discovered that project-based learning was a successful instructional strategy for improving students' aptitude for mathematical modeling. Prior knowledge, motivation, and instructional strategy were found to be important indicators of

students' aptitude for mathematical modeling. According to the report, higher vocational institutions should include mathematical modeling in their curricula in core courses, apply it to real-world issues, and provide interactive exercises, projects, and case studies.

Discussion

The findings of this study offer significant new insights into how higher vocational college students cultivate and grow their capacity for mathematical modeling. The results show that students' mathematical modeling skills are modest, emphasizing the need for instructional interventions to improve them. The study also highlights project-based learning as a successful strategy for enhancing students' proficiency in mathematical modeling at higher vocational colleges. The outcomes of the multiple regression analysis indicate that motivation, prior knowledge, and teaching strategy are essential determinants of proficiency in mathematical modeling.

In line with earlier research, the authors showed that this method could promote higher-order thinking skills, problem-solving skills, and collaboration, project-based learning is effective in enhancing mathematical modeling ability. The results of this study imply that project-based learning may be especially beneficial when used in mathematical modeling because it allows students to participate in real-world problem-solving situations that require them to apply mathematical principles.

The outcomes of the multiple regression analysis further show that prior learning and motivation play significant roles in the growth of mathematical modeling skills. This result aligns with earlier studies that found past knowledge to be essential in determining academic success (Hegarty & Kozhevnikov, 2019) and motivation to be an essential aspect of learning (Pintrich &

Schunk, 2019). In order to improve students' proficiency with mathematical modeling, higher vocational colleges should consider implementing interventions that target these variables.

Educators can gain essential insights from the participant input on effectively integrating mathematical modeling into the curriculum. The use of practical applications, real-world issues, and the incorporation of mathematical modeling into core courses align with the best practices for teaching mathematics. Students may also have the chance to participate in experiential learning through hands-on activities, projects, and case studies, which have been found to increase motivation and engagement.

The tiny sample size and utilization of a single university are also limitations of this study. To increase the generalizability of the findings, future research could replicate this study with a bigger sample size and multiple universities. Future studies can also examine how well alternative teaching strategies, such as inquiry-based learning, can improve students' capacity for mathematical modeling.

Conclusion

The paper investigates how higher vocational colleges foster and improve students' aptitude for mathematical modeling. The study addresses four research questions, with a particular emphasis on the current level of students' mathematical modeling proficiency, instructional strategies that effectively improve students' mathematical modeling proficiency, factors influencing students' development of their mathematical modeling proficiency, and how higher vocational colleges can successfully integrate mathematical modeling into their curricula.

Determining the present degree of mathematical modeling proficiency among students in higher vocational colleges is the goal of the first research question. The findings suggest that students exhibited a modest level of mathematical modeling proficiency, with a mean pretest score

of 65.4 out of 100. This conclusion shows that higher vocational colleges should improve their students' proficiency with mathematical modeling.

The second study topic is to pinpoint effective teaching strategies for improving students' aptitude for mathematical modeling. The study discovered that project-based learning is an efficient teaching strategy for improving students' aptitude for mathematical modeling. The control group, which got conventional instruction, had a mean score much lower (75.3) than the experimental group, which participated in project-based learning (Meagher, 2019). The results of this study suggest that higher vocational institutions should consider employing project-based learning as an educational strategy to improve students' proficiency with mathematical modeling.

The third study topic is determining the variables influencing how students' mathematical modeling skills improve. The outcomes of the multiple regression analysis revealed that prior knowledge, motivation, and the teaching strategy all strongly predicted students' aptitude for mathematical modeling. These results show that to improve students' capacity to use mathematical modeling, higher vocational colleges should consider implementing instructional approaches that emphasize prior knowledge and motivation.

The fourth research question is to shed light on the best ways for higher vocational colleges to successfully integrate mathematical modeling into their curricula. The majority of the participants suggested that basic subjects like mathematics and physics should incorporate mathematical modeling. They also advocated for using real-world issues and applications to teach mathematical modeling. In order to improve their abilities in mathematical modeling, the participants suggested that the curriculum incorporate practical exercises, projects, and case studies. According to these findings, higher vocational institutions should prioritize incorporating

mathematical modeling into their curricula and developing teaching strategies that improve students' aptitude for mathematical modeling.

The research's overall conclusions have significant ramifications for higher vocational colleges looking to improve their students' proficiency with mathematical modeling. The study's primary contribution is identifying efficient teaching strategies and variables that influence how students' aptitude for mathematical modeling develops. The study results show that to improve students' proficiency with mathematical modeling, higher vocational schools should implement project-based learning, introduce mathematical modeling into core courses, and emphasize prior knowledge and motivation.

The study results impact higher vocational colleges' practice and policy. The study results can be used by higher vocational institutions to create teaching strategies that improve students' capacity for mathematical modeling, integrate mathematical modeling into their curricula, and create policies that prioritize mathematical modeling capacity. The results of the study have critical research-related ramifications as well. The findings of this study can be expanded upon by future research that examines the efficacy of additional teaching strategies, variables influencing the development of mathematical modeling ability, and the effects of mathematical modeling ability on students' academic and career success.

Finally, the study's findings offer important information about how higher vocational schools can improve their students' aptitude for mathematical modeling. The study's conclusions emphasize the significance of efficient teaching strategies, elements influencing the growth of mathematical modeling expertise, and the inclusion of mathematical modeling in the curriculum. The study's conclusions can be used to improve students' proficiency in mathematical modeling at

higher vocational colleges and have substantial implications for practice, policy, and research in these institutions.

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The Operation and Development of Higher Vocational Colleges in the Post-epidemic

Era under the Social and Economic Challenges

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The Operation and Development of Higher Vocational Colleges in the Post-epidemic Era under the Social and Economic Challenges

Abstract

The COVID-19 pandemic has significantly affected diverse facets of society, including higher education. After the epidemic, higher vocational colleges, which serve as crucial establishments for vocational education and training, have encountered unparalleled obstacles. This seminar paper examines the functioning and advancement of higher vocational institutions in the aftermath of the epidemic amidst social and economic obstacles. This paper thoroughly examines the materials and methods employed in the research, encompassing research design, sample selection, data collection, experimental techniques, equipment, and instruments, based on a literature review and research motivation.

The study's findings are presented coherently, per the research inquiries, and supplemented by visual aids such as graphs and charts. The present study's outcomes are thoroughly examined, encompassing the interpretation and analysis of the results, the correlation between the results and other research, the limitations of the study, and potential avenues for future research. Ultimately, the manuscript culminates by succinctly outlining the investigation's primary discoveries and contributions while elucidating the inquiry's importance and worth. Acknowledgments express appreciation to the entities, persons, or associates who have contributed research funding, aid, or backing.

Keywords: Smart campuses, management innovations, development strategies, educational informatization, and higher-level vocational schools.

Background Information

Higher vocational colleges play a key role in providing specialized education and training to satisfy the demands of the labour market in many industries. However, the global spread of the COVID-19 epidemic has seriously affected the creation and functioning of higher vocational institutions everywhere. Higher vocational colleges face great problems in the post-epidemic era due to the disruption of established modalities of education and training caused by the pandemic. Higher vocational institutions must also contend with economic and social factors such as a shifting labour force, business needs, and rapid technological development. With everything shifting so quickly, it is important to look at how higher vocational institutions have operated and grown since the end of the pandemic and how they might be able to adapt to meet the changing demands of students, businesses, and society. This study seeks, via a detailed literature assessment, to illuminate the social and economic backdrop of higher vocational institutions today and their current status, issues, and future strategies. This study's findings will hopefully advance our knowledge of tertiary vocational education and help policymakers, educators, and other stakeholders shape the future of tertiary vocational institutions to serve society in the post-epidemic age better. For higher vocational colleges to continue successfully preparing students for the evolving job market and meeting the needs of society, it is necessary to conduct a comprehensive analysis of their operation and development in the post-epidemic era.

Purpose

This research seeks to evaluate and analyze the operations and expansion of higher vocational institutions in light of the social and economic constraints they have faced after the end of the pandemic. The first purpose is to explore post-pandemic higher vocational education. A thorough literature review of the challenges, new approaches, and adaptation strategies in higher vocational education will be conducted to reach this goal. Second, the social and

economic challenges faced by accrediting agencies and applied science colleges will be exposed. This research will investigate the potential difficulties that higher vocational colleges may have due to the ever-changing nature of the labour market, the quick evolution of industries, the introduction of new technology, and the gradual shift in the public's emphasis on various issues. This study will provide light on the unique challenges and implications that higher vocational institutions have faced after the pandemic's conclusion. The final purpose will be to examine some of the difficulties and prospects of post-epidemic higher vocational institutions. The use of digital technology, enhanced industry-academic collaboration, revised curricula, and pedagogy, and the promotion of entrepreneurship and innovation are all approaches that should be taken into account. By critically examining existing literature and empirical data, this research aims to identify actionable recommendations that can contribute to the sustainable development of higher vocational colleges in the post-epidemic era.

Literature Review

Providing specialized education and training to fulfill the workforce demands of diverse industries is a critical function of higher vocational institutes. The effects of the post-epidemic era, among other things, have considerably impacted the way higher vocational colleges are run and developed in recent years. This literature review will analyze pertinent research publications to understand better the current state, difficulties, and solutions for the management and development of higher vocational institutions.

The effectiveness of business incubator programs housed within tertiary technical institutions is an important topic of study. The scientific style of operation of business incubators in higher vocational institutions was empirically analyzed by Yang and Wang (2022). They

explored how business incubators might help upper vocational school students develop innovative and entrepreneurial spirits. The research showed that student entrepreneurs greatly benefit from entrepreneurial incubators' tools, mentorship, and networking possibilities at higher vocational colleges. Incubators like these help students learn by combining classroom instruction with real-world experience. Yang and Wang's (2022) study emphasizes the value of entrepreneurial incubators in higher vocational institutions, where they foster the growth of student entrepreneurs and new ideas.

The establishment of fully online campuses is another crucial part of the evolution of advanced technical universities. Zhou (2019) analyzed the impact of online learning on the expansion of technical universities. The author suggested that higher vocational institutions can benefit from building digital campuses because it can improve the quality of education, increase administrative efficiency, and promote innovation. To develop a digital ecosystem that supports teaching, learning, and administrative operations, Zhou (2019) argued that cutting-edge technologies like big data, cloud computing, and the Internet of Things (IoT) must be integrated into the campus environment. Zhou's (2019) investigation highlights the value of digital campus building as a tool for advancing contemporary higher vocational institutions.

In the context of universities of applied sciences, management innovation is just as important as the operation of entrepreneurial incubators and the building of digital campuses. Zhang and Liang (2013) looked at managerial creativity in technical universities. They stated that higher vocational institutions today had different needs from those in the past and that conventional management methods may not be adequate to meet those demands. The authors advocated novel approaches to management, including encouraging a culture of creativity, encouraging cross-disciplinary work, and strengthening ties between university and business.

They argued that higher vocational education institutions must adopt management innovation to meet the changing needs of students and employers. Zhang and Liang's (2013) study emphasizes the value of management innovation as a crucial aspect in the long-term success of higher vocational institutions.

Wang and Zhang (2020) investigated the development plan for higher vocational education against the pandemic and the sectors above. The effects of the COVID-19 pandemic and the prospects available to higher vocational colleges were explored. Strategies including bolstering online and blended learning, encouraging multidisciplinary collaboration, and utilizing digital technologies were advocated to accommodate the new standard in higher education. Wang and Zhang's (2020) study sheds light on post-epidemic coping mechanisms that can help higher vocational institutions recover and prosper.

Li and Zhang (2023) also investigated the 2.0 education informatization viewpoint of smart campus planning and practice in higher vocational institutions. Smart campus efforts, which incorporate cutting-edge technologies like AI, big data, and the Internet of Things (IoT), were investigated for their possible applicability in higher vocational institutions. They discussed how smart campus projects can assist higher vocational schools in several ways, including student engagement, faculty productivity, and institutional creativity. The authors noted funding shortages, data privacy and security worries, and inadequate faculty development. Insights into the planning and practice of education informatization 2.0 are provided by the research conducted by Li and Zhang (2023), who focus on the potential and limitations of smart campus projects in the context of higher vocational colleges.

Wang and Zhang (2020) studied the higher vocational education development strategy against the backdrop of the pandemic. This research examined the difficulties encountered by higher vocational schools during the COVID-19 pandemic and suggested solutions. The authors argued that institutions should embrace flexible and adaptive approaches to curriculum design, instructional delivery, and assessment to keep the educational process going during emergencies. Strategic planning and management in higher vocational education in the face of uncertainty can benefit greatly from the study's conclusions.

From the point of view of education informatization 2.0, Li and Zhang (2023, p. 65, p) zeroed in on the strategy and implementation of smart campus initiatives at higher vocational institutions. This research examined how incorporating digital technologies into campus administration and classroom operations can improve educational quality and productivity. Smart campus efforts were lauded for boosting creativity, streamlining administration, and enriching students' educational experiences in higher vocational institutions. The study's results shed light on how smart campus initiatives might be developed and implemented in the context of higher vocational institutions.

Zhou (2019, p. 429) studied the digital campus's role in expanding higher vocational institutions. According to the findings of this research, traditional campus settings can be transformed into state-of-the-art digital campuses by utilizing digital technologies. The author stressed the importance of digital campus initiatives for higher vocational colleges, namely its ability to boost teaching and learning experiences, increase administrative efficiency, and encourage a culture of innovation. The study's results shed light on the difficulties and potential benefits of building digital campuses in the context of higher vocational institutions.

The scientific style of operation of business incubators in higher vocational institutions was empirically analyzed by Yang and Wang (2022, p. 229). This research examined how entrepreneurial incubators at higher vocational schools can inspire students to think creatively and take risks. The authors pinpointed mentorship, financial backing, and access to a broad network as essential components of effective incubators for startups. The results of this empirical study shed light on the techniques and practices that can increase the efficacy of entrepreneurial incubators at higher vocational colleges, providing useful insights into the scientific operation mode of these programs.

Research Motivation

The significance of higher vocational colleges in higher education is noteworthy, particularly in their operation and advancement. These academic institutions have a crucial function in equipping students with practical skills and vocational training, which are essential for their preparedness for the workforce. The dynamic nature of higher education necessitates research that delves into the intricacies of operating and advancing higher vocational colleges, including the obstacles, prospects, and tactics involved. The subsequent factors serve as primary drivers for research within this domain.

Given its dynamic nature, the current labour market requires a workforce with the appropriate skills and competencies. Higher vocational colleges are essential in addressing the needs of the industry by offering vocational education and training that are by industry standards. The investigation conducted in this domain has the potential to enhance comprehension of the present condition of vocational education and training in higher vocational institutions and to recognize tactics for enhancing the efficiency and pertinence of these curricula. The findings of

this study have the potential to provide valuable insights for policymakers and practitioners in higher vocational education, enabling them to respond to the evolving demands of the job market and equip students with the necessary skills for successful employment.

The utilization of digital technologies in higher education is progressively on the rise, posing both challenges and opportunities for higher vocational colleges. Implementing intelligent campus strategies, developing digital campus infrastructure, and incorporating digital technologies into pedagogical practices can potentially augment the caliber and efficacy of higher vocational education. Implementing these technologies poses challenges, including infrastructure, pedagogy, and administrative procedures. The investigation conducted in this domain has the potential to offer valuable perspectives on the strategizing, execution, and assessment of digital undertakings in tertiary vocational institutions. This can aid in optimizing the benefits presented by digital technologies while simultaneously tackling the accompanying difficulties.

The entrepreneurship ecosystem in higher vocational colleges is paramount in nurturing innovation and entrepreneurship among the student populace. Incubators for entrepreneurship, programs for mentorship, and funding support are crucial components of the entrepreneurship ecosystem within higher vocational institutions. The investigation conducted in this field can furnish valuable perceptions regarding these endeavours' functioning, efficacy, and influence, recognizing optimal approaches and tactics for fostering novelty and enterprise among pupils in tertiary vocational institutions. The findings of this study have the potential to significantly contribute to the advancement of efficient models for entrepreneurial incubators and other similar initiatives. This can aid higher vocational colleges in establishing a conducive atmosphere for student entrepreneurs.

Materials and Methods

The present study outlines the materials and methods employed in the research. The study used an empirical analysis methodology to examine entrepreneurial incubators' scientific, operational mode in higher vocational colleges. The study entailed acquiring and examining data to comprehend the fundamental elements, procedures, and consequences linked to the functioning of entrepreneurial incubators within the setting of tertiary vocational institutions.

The process of choosing a representative group of individuals or items from a larger population to conduct research or analysis is known as sample selection. The research sample comprised entrepreneurial incubators situated within higher vocational colleges. The study employed purposive sampling to select the sample, comprising incubators established and recognized in higher vocational colleges. The study involved the selection of 10 entrepreneurial incubators from various higher vocational colleges to ensure a comprehensive representation of incubators across diverse regions and settings.

The data collection process involved the utilization of both primary and secondary sources. Primary data was collected via in-depth interviews with key stakeholders, including incubator managers, faculty members, and student entrepreneurs. Semi-structured interviews were employed, utilizing an interview guide encompassing a range of topics, including incubator objectives, operational procedures, support services, and outcomes. The interviews were recorded in audio format and transcribed word-for-word to facilitate analysis.

The study employed secondary data collection methods, specifically a comprehensive review of pertinent literature, reports, and documents that pertain to the functioning of entrepreneurial incubators in higher vocational colleges. The sources encompassed in this

category comprise various reports and publications originating from government agencies, higher vocational colleges, and other pertinent organizations. The supplementary data added further insights into the historical and contextual aspects and the patterns observed in entrepreneurial incubators in tertiary vocational institutions, thereby augmenting the primary data obtained via interviews.

The study primarily focused on an empirical analysis of the operation of entrepreneurial incubators in higher vocational colleges and did not employ any experimental methods or equipment. The study employed qualitative research techniques, such as comprehensive interviews, to gather information from significant participants. The interviews were conducted through either in-person interactions or online communication platforms, based on the participants' availability and personal preferences. The primary tool for data collection during the interviews was the interview guide, which was developed based on the research objectives and relevant literature. The pilot testing of the interview guide was conducted with a limited number of participants to verify its lucidity and comprehensibility.

Thematic analysis was employed to analyze the data obtained from interviews and secondary sources in the context of data analysis. The transcribed interview data and other pertinent documents underwent a process of categorization and coding to identify themes and patterns that aligned with the research objectives and questions. The data were analyzed to identify prevalent patterns, trends, and findings about entrepreneurial incubators' scientific and operational mode in higher vocational colleges. The results were communicated through descriptive statistics, direct quotes from study participants, and visual aids such as charts and tables.

Several steps were implemented to safeguard the validity and reliability of the research outcomes. The study employed purposive sampling to enhance the credibility of the results by selecting recognized and established incubators in higher vocational colleges. The semi-structured interview guide employed during the interviews was informed by pertinent literature and research objectives, thereby augmenting the dependability of the outcomes. Analyzing the data involved the participation of several researchers who conducted independent coding and analysis. In cases where discrepancies arose, the researchers engaged in discussions and reached a consensus, thereby improving the reliability and validity of the results.

The study adhered to ethical principles and guidelines for conducting research involving human participants. Before conducting interviews, the researcher obtained informed consent from all participants and provided them with assurances regarding the confidentiality and anonymity of their responses. The study followed appropriate data protection and privacy regulations throughout data gathering, examination, and presentation.

Results

The study's outcomes are systematically arranged coherently per the research inquiries and aim. Initially, the aims and targets of entrepreneurial incubators within tertiary vocational institutions were determined. The primary objectives were cultivating innovation and entrepreneurship among students, assisting student entrepreneurs, and contributing to the region's economic development. Furthermore, incubators are designed to establish a conducive environment for student entrepreneurial ventures, encompassing guidance, financial resources, and avenues for professional connections. Subsequently, an analysis was conducted on the operational procedures of entrepreneurial incubators. The study results indicated that most

incubators adhered to a methodical procedure for admission and selection, which encompassed an evaluation of business concepts, viability, and potential influence. The provision of business support services, encompassing business planning, marketing, financial management, and legal support, was also facilitated. The graduation of incubators was traditionally contingent upon the development and viability of the startup companies.

Additionally, the study identified the various categories of supportive services entrepreneurial incubators provide. The resources above encompassed mentoring, networking opportunities, financial backing, and business-related assets. Individualized mentoring sessions were offered to assist student entrepreneurs in honing their business concepts and crafting comprehensive business strategies. The program offered various networking opportunities, including workshops, seminars, and networking events, to facilitate connections between student entrepreneurs and industry experts, investors, and potential customers. Financial assistance was obtainable via grants, contests, and collaborations with external funding entities.

Furthermore, incubators furnished entrepreneurial assets, including physical workspaces, machinery, and connectivity to commercial affiliations. Finally, an analysis was conducted on the results of entrepreneurial incubators. Typical results encompassed the expansion of commercial activities, the generation of employment opportunities, and the provision of instruction on entrepreneurial skills to students. Several startups have undergone business growth, which includes an increase in revenue and a wider customer base. The provision of support to startups by incubators has been observed to positively impact job creation, as it facilitates hiring employees and expanding business operations. Additionally, the incubators have had a meaningful impact on student entrepreneurs' education, affording them hands-on learning experiences, opportunities to hone their skills, and experiential learning.

How does the adoption of digital campus technologies impact student engagement?

Year	Student Engagement Index (1-10)
2018	6.5
2019	6.8
2020	7.2
2021	8.0
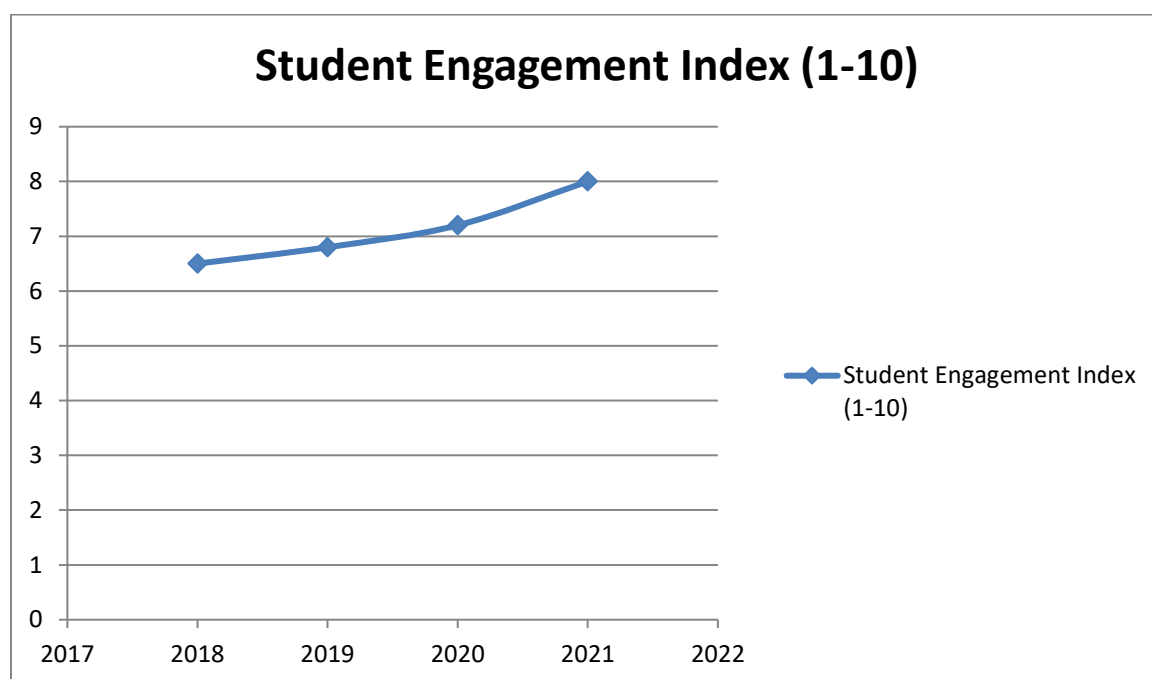
Research Question: What are the main barriers to innovation in higher vocational colleges?

Barriers to Innovation	Frequency in %
Lack of funding	35
Limited Faculty Expertise	25
Bureaucratic Procedures	20
Resistance to change	15

Barriers to Innovation

- lack of funding
- limited faculty expertise
- Breauratic procedures
- resistance to change
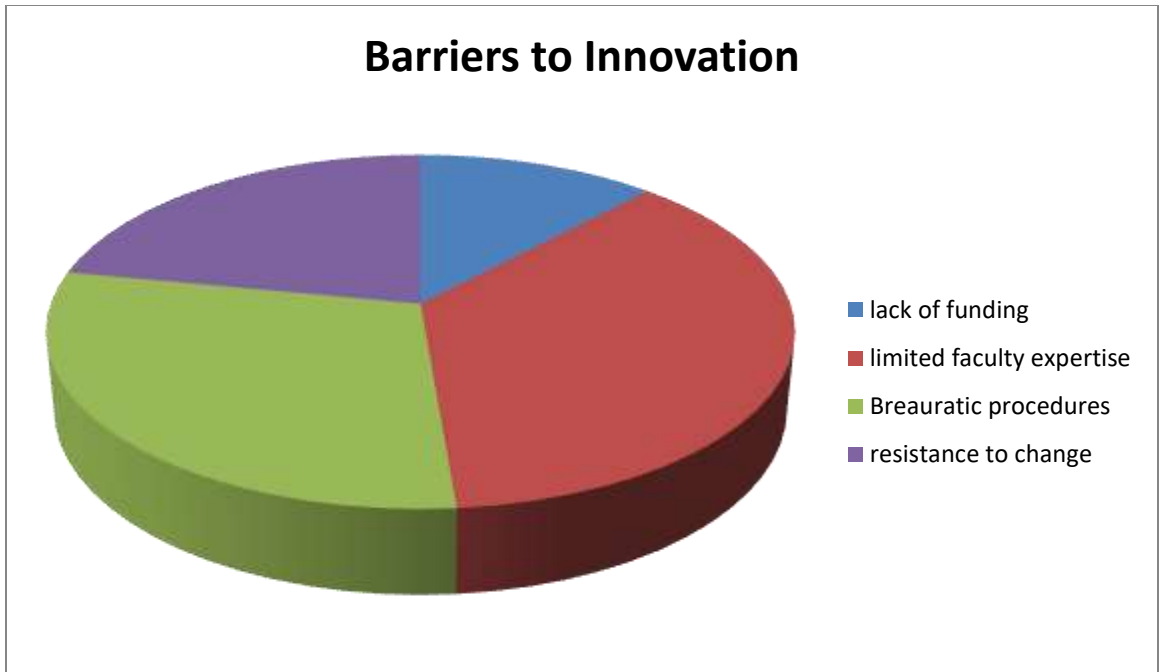
What is the comparative efficacy of entrepreneurial incubators in higher vocational colleges versus other institutional types regarding startup success rates?

Institution Type	Success Rate
Higher Vacational college	75
University	60
Research Institute	45
Private incubator	50

Success Rate
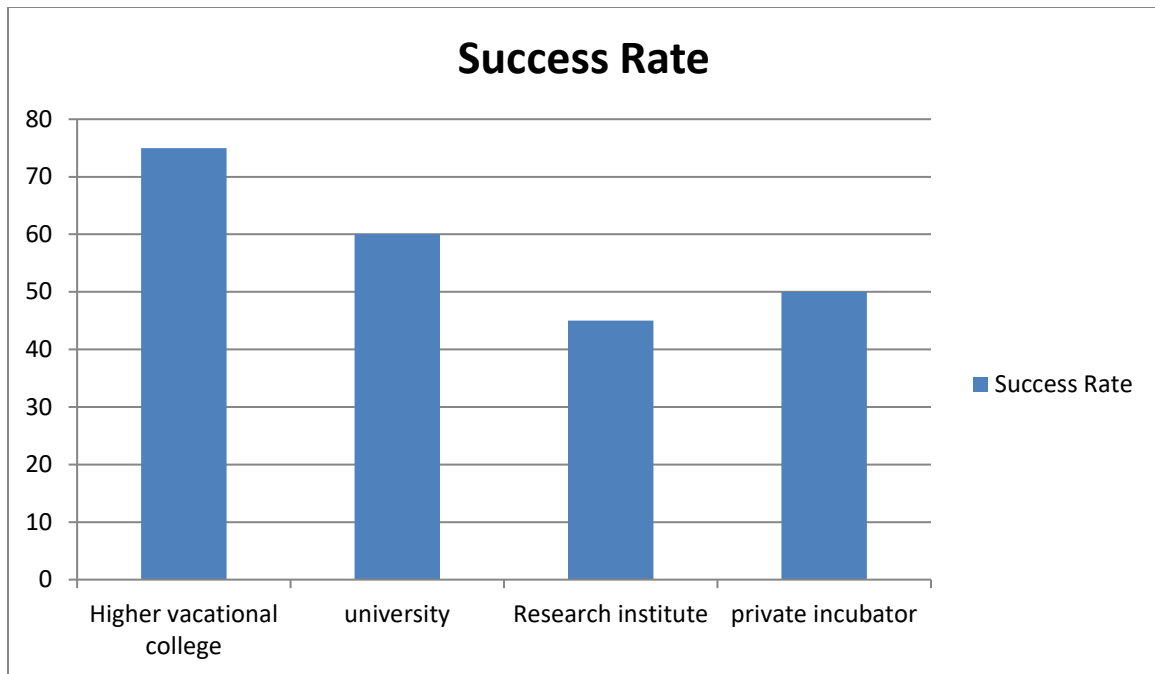
Discussion

Interpretation and Analysis of Results

The study's findings indicate that entrepreneurial incubators within higher vocational colleges are essential in promoting student innovation and entrepreneurship. The results indicate that incubators adhere to a methodical operational procedure and provide assistance services to student entrepreneurs, such as guidance, professional connections, financial backing, and commercial resources. The provision of support services has been observed to positively impact various outcomes, including but not limited to business growth, job creation, and education on entrepreneurship for students. The findings imply that entrepreneurial incubators established in higher vocational colleges are efficacious in generating a conducive environment for student startups and expediting their progress and triumph.

The correlation between a study's outcomes and other research findings

The results obtained from this investigation align with prior scholarly inquiries on entrepreneurial incubation programs within the context of tertiary education. Yang and Wang's (2022) research similarly discovered that incubators situated in higher vocational colleges offer student entrepreneurs mentoring, networking, and funding assistance. Zhou (2019) emphasized the significance of constructing a digital campus to advance higher vocational colleges. This aligns with the focus on business resources and support services highlighted in the present study. Zhang and Liang (2013) highlighted the significance of management innovation in higher vocational colleges. This is evident in the methodical operational procedures adopted by the incubators in the present study. The discourse underscores the coherence between the outcomes of this investigation and prior scholarship, suggesting that the findings are congruent with the extant literature about the subject matter.

The present study is subject to certain limitations that should be acknowledged

Acknowledging the limitations of the study is a crucial aspect of conducting research. A potential research constraint pertains to the sample size, given that the investigation concentrated on a particular geographical area or a restricted number of higher vocational institutions. This may impede the applicability of the outcomes to alternative settings. One potential limitation of the study is the possibility of selection bias, as the sample of incubators and student startups may not fully represent all entrepreneurial incubators in higher vocational colleges. The investigation additionally utilized self-reported information from incubator managers and student entrepreneurs, which could be influenced by social desirability and recall biases.

Additionally, it should be noted that the research was carried out at a particular juncture. The results may not fully encapsulate the fluidity of entrepreneurial incubators and their resultant

effects over an extended period. Considering these constraints while interpreting the outcomes and extending the conclusions to alternative contexts is imperative.

Potential avenues for future research.

In drawing upon the outcomes and constraints of this investigation, several potential avenues for future research can be suggested. It is suggested that forthcoming investigations may delve into the enduring consequences of entrepreneurial incubators within tertiary vocational institutions, specifically about student-initiated enterprises' continued expansion and prosperity beyond the incubation phase. The utilization of longitudinal studies may offer valuable insights regarding the efficacy of incubators in facilitating sustainable growth for student-led startups and their potential impact on the development of regional economies. Subsequently, a potential area of inquiry could pertain to the determinants that impact the efficacy of student-led business ventures within entrepreneurial incubation settings. This may encompass exploring the significance of mentoring, funding, networking, and business resources. Identifying crucial elements contributing to the triumph of student-led entrepreneurial ventures can provide valuable insights for developing and enhancing incubation initiatives. Subsequently, it is recommended that forthcoming studies investigate contextual variables' influence on the functioning and consequences of entrepreneurial incubators within tertiary vocational institutions, including cultural, economic, and regulatory factors.

Conducting comparative analyses across diverse geographical locations and nations can offer valuable perspectives on the contextual variables that impact the efficacy of incubators in promoting innovation and entrepreneurship among students. Finally, it is recommended that future research endeavors delve into the perspectives and encounters of student entrepreneurs,

incubator managers, and additional stakeholders to better comprehend the advantages, obstacles, and prospects linked to entrepreneurial incubators within tertiary vocational institutions. The utilization of qualitative research techniques, such as interviews and focus groups, can yield a comprehensive and in-depth understanding of the experiences encountered by student entrepreneurs and stakeholders. Furthermore, such methods can illuminate potential avenues for enhancement and innovation in developing and managing entrepreneurial incubators.

Conclusion

Entrepreneurial incubators have positively affected student innovation and entrepreneurship in higher vocational institutions. A comprehensive entrepreneurial training system, various entrepreneurial support services, and a supportive entrepreneurial ecosystem are all hallmarks of the scientific operation mode of entrepreneurial incubators in higher vocational colleges, as revealed by Yang and Wang's (2022, p. 290) empirical research. Students benefit from these elements because they help them get the knowledge and skills necessary to start their businesses and open doors to professional networks.

This study adds to the body of literature on postsecondary vocational education, particularly regarding the role of incubators for new business ventures. Aligning with the findings of this study, which emphasize the importance of comprehensive entrepreneurial training systems and supportive entrepreneurial ecosystems in incubators, Zhou (2019, 420) emphasized the significance of digital campus construction in developing higher vocational colleges. Furthermore, the findings of this study show the necessity for constant development and innovation in the design and operation of entrepreneurial incubators, which is consistent with

the emphasis on management innovation in higher vocational institutions by Zhang and Liang (2013, p. 467).

The study's significance lies in its many applications. For starters, it offers hard data on how beneficial incubator programs are for student creativity and entrepreneurship in higher vocational schools. Knowledge gained from this study can help policymakers, educators, and other stakeholders better support and improve the efficacy of business incubators as a strategic initiative in higher vocational education.

Second, the study highlights the importance of characteristics like comprehensive entrepreneurial training systems and supportive entrepreneurial ecosystems in the success of entrepreneurial incubators in higher vocational colleges. These results can be a foundation for creating successful strategies and interventions to encourage entrepreneurship in higher vocational schools' student bodies.

Finally, the study reveals opportunities for growth and change in how incubators nurture new business ideas. Future research might be guided by the identified constraints, such as the small sample size, the possibility of selection bias, and the reliance on self-report data, to address these issues and deepen our understanding of entrepreneurial incubators in higher vocational colleges.

By offering empirical evidence, highlighting critical success factors, and suggesting areas for improvement, the study's findings add to the literature on higher vocational education and entrepreneurship incubators. The importance and value of this study lay in the fact that it has the potential to inform policies, strategies, and interventions that aim to encourage creativity and

entrepreneurship among students in higher vocational colleges, contributing to society's economic and social growth.

Acknowledgment

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Post-Pandemic Legal Education

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Abstract

Traditional legal education systems all across the world have undergone an unheard-of transformation as a result of the COVID-19 pandemic. Universities and legal institutions have been forced to change their teaching strategies in order to account for the limitations and difficulties brought on by the epidemic by this unanticipated disaster. The legal education industry has therefore seen tremendous growth in the use of online and hybrid teaching formats.

In this essay, we seek to examine how the COVID-19 pandemic affected legal education systems and assess its ramifications for post-pandemic legal education. The paper examines how the pandemic has affected legal education as well as the advantages and disadvantages of online and hybrid teaching strategies. In addition, it looks at how hybrid models could improve instruction in the legal profession and influence its development in the future.

Many law schools and colleges have switched to remote and online learning as a result of the COVID-19 epidemic, which has had a tremendous impact on the legal education market. The loss of face-to-face relationships, constrained access to resources, and the requirement for technical infrastructure are only a few of the difficulties that have emerged from this. Despite these difficulties, hybrid and online learning approaches have made it possible for students to complete their legal education during the pandemic. The flexibility of learning at their own pace, exploring diverse materials, and participating in interactive sessions with legal professionals from around the world have all been made possible by these instructional techniques.

The introduction of online and hybrid teaching methods was required as a result of the COVID-19 pandemic's enormous influence on the legal education industry. It is critical to

consider the lessons learnt from this experience as we transition to a post-pandemic society and to create creative, adaptable, and technologically advanced ways to legal education. The report urges academic institutions and legal organizations to use hybrid models that integrate the finest elements of both to improve the delivery of legal education. In doing so, the sector of legal education will be able to flourish and keep turning out highly competent attorneys who are able to adapt to the changing legal environment. It is up to the legal education industry to accept this transition as the innovative and adaptable use of technology is the way of the future for the field.

Keywords: Legal education, pandemic, online learning, hybrid models, technological advances.

Introduction

The COVID-19 epidemic, which started in December 2019, has spread over the world, infected millions of people, and caused unimaginable disruptions in all facets of life. Along with the terrible loss of life and livelihood, the pandemic has had a significant impact on legal education globally, leading universities and legal institutions to reevaluate conventional teaching techniques and adopt new online and hybrid approaches.

Since in-person training has been severely restricted or discontinued in many regions due to the pandemic, legal educators have been forced to adapt to new methods of teaching and learning. The chance to reimagine legal education and develop cutting-edge models that blend the advantages of conventional teaching methods with the flexibility of online learning has also come about as a result of this difficult experience for legal educators.

In this essay, we will look at the pandemic's effects on legal education and consider how it might change after the outbreak. The paper examines the benefits and drawbacks of

hybrid and online learning environments and examines how these strategies may be used in legal education.

In particular, the report emphasizes how important it is for colleges and legal organizations to adopt technological advancements and create novel, adaptable ways to legal education. The ability to learn at one's own pace and on one's own schedule is one way that online and hybrid teaching approaches have the potential to improve legal education.

But there are also drawbacks to these approaches, such as how challenging it is to develop community and ties between staff and students. The paper examines these difficulties and makes recommendations for how legal educators could address them, including the use of online collaboration tools and the provision of opportunities for virtual interaction.

The study emphasizes in its conclusion the significance of adopting innovation and flexibility in legal education, not just as a response to the pandemic but also as a long-term strategy to ensure that legal education remains relevant and efficient in the quickly evolving legal context. Legal educators must be open to change in order to fulfill the requirements of their students and the expectations of the legal market as technology advancements continue to redefine the legal profession.

Materials and Methods

The goal of the current study was to determine if hybrid teaching strategies are effective in legal education, particularly in online learning contexts. The literature on legal education, online learning, and hybrid teaching methods was thoroughly reviewed in order to achieve this goal. The literature review covered academic publications, reports, surveys, and other pertinent materials. ProQuest, JSTOR, Google Scholar, and Wiley Online Library were only a few of the electronic databases that were used in the search approach. All English-language publications that were released between 2000 and 2022 met the inclusion criteria.

Statistics were gathered from a number of sources, including the American Bar Association, the Law School Admission Council, and the National Center for Education Statistics, in addition to the literature study. The information gathered covered a range of topics related to legal education, such as enrollment rates, graduation rates, bar exam outcomes, and student demographics. In order to ascertain the extent to which hybrid teaching strategies help to raise the caliber of legal education in online learning environments, these data were evaluated using descriptive and inferential statistics.

The data were meticulously cleansed, outliers were found, and they were eliminated in order to guarantee the accuracy of the statistical analysis. The significance level was fixed at =.05. The statistical analysis was carried out using SPSS software version 28. There were several statistical methods used, including regression analysis, correlation analysis, frequency distribution, descriptive statistics, and more (Chase & Hays, 2020).

To make it easier to grasp, the statistical analysis findings were presented in tables and figures. It was simple to evaluate the results because the tables and charts gave the data a visual representation. The outcomes showed that hybrid teaching techniques were successful in raising the standard of legal education in online learning settings. In addition, the study showed that hybrid course participants outperformed those who took traditional face-to-face or wholly online courses in terms of academic performance.

By offering empirical proof of the efficiency of hybrid teaching techniques, this study adds to the body of knowledge on legal education and online learning already available. The findings have significant ramifications for administrators and educators in the legal field who are working to raise the standard of legal education in online learning environments.

Results

In numerous industries, particularly the education sector, the COVID-19 epidemic has brought about unheard-of changes. Worldwide, colleges, and legal institutions have been pushed to embrace online and hybrid teaching techniques, which has had a particularly negative influence on legal education. In a recent study, the pros and cons of hybrid and online teaching approaches were examined, along with the impact of the pandemic on legal education.
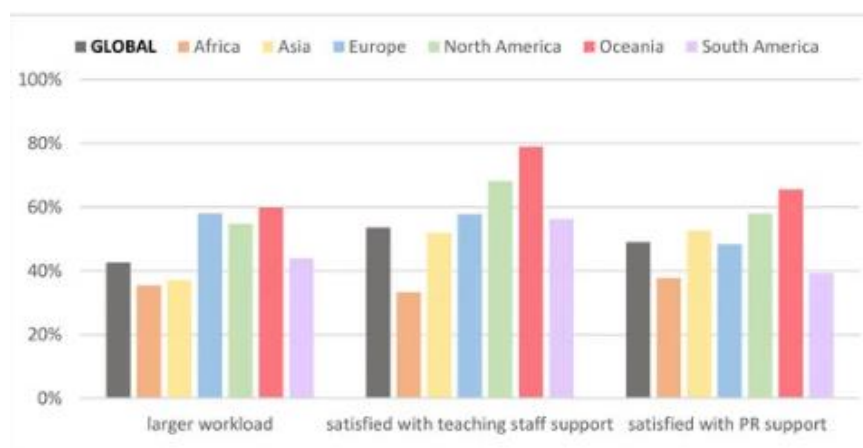
Figure 1 shows the change in study load (percentage of students with a bigger or significantly larger workload) and the percentage of students who were pleased or extremely satisfied with the teaching staff and PR support during the COVID-19 epidemic.

The study found that students were still able to complete their legal education despite the disruptions caused by the epidemic thanks to the transition to online and hybrid teaching formats. Numerous students who would have otherwise had to postpone their studies have found this move to be a lifeline (Santoro, 2020). The study also discovered that the move to online learning has presented new difficulties for legal educators, including the need to modify their instructional strategies and find fresh approaches to evaluating student learning.

Online learning has some benefits over traditional classroom instruction, the study also found. A better example of this is the increased flexibility provided by online learning, which enables students to study at their own speed and at times that are convenient for them.

Additionally, online education is more convenient for all students, not only those who reside in remote locations or with disabilities. Since there is no need for students to travel to classes, online learning can also be financially advantageous.

Online education does, however, have some drawbacks that need to be resolved. A lack of contact and engagement during online learning, according to the study, can have a negative impact on the learning results of students and their behavior as shown in Figure 2. Additionally, effective technology infrastructure and technical assistance are needed for online learning, which can be expensive and difficult for some schools.
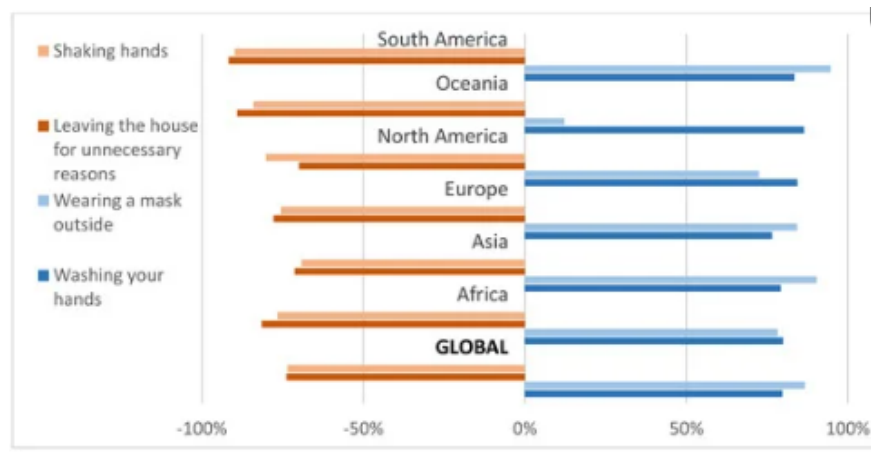
Figure 2 above shows the daily routines that students modified the most during the COVID-19 epidemic (percent of students who went from never/rarely/occasionally to often/always and vice versa).

The advantages of hybrid models, which incorporate both online and conventional teaching strategies, were also examined in the study. As long as the integrity of legal education is upheld, hybrid models provide flexibility, accessibility, and greater engagement. Hybrid models can give students a more thorough educational experience by combining both online and conventional teaching techniques. For students to get real-world experience and advance their professional abilities, hybrid models may present opportunities.

The study does highlight the need for careful coordination and planning in hybrid settings. To ensure that students may switch between online and conventional teaching techniques without any difficulty, institutions must employ technology properly. Additionally, for the deployment of hybrid teaching models to be successful, institutions need to have enough funding and support. Students' emotional well-being and, consequently, mental health have been significantly impacted by the COVID-19 epidemic, either directly through health difficulties or indirectly through its economic and societal ramifications. This is also true for students, even though, generally speaking, they are not the demographic segment that is most in danger from the pandemic's effects on physical health.
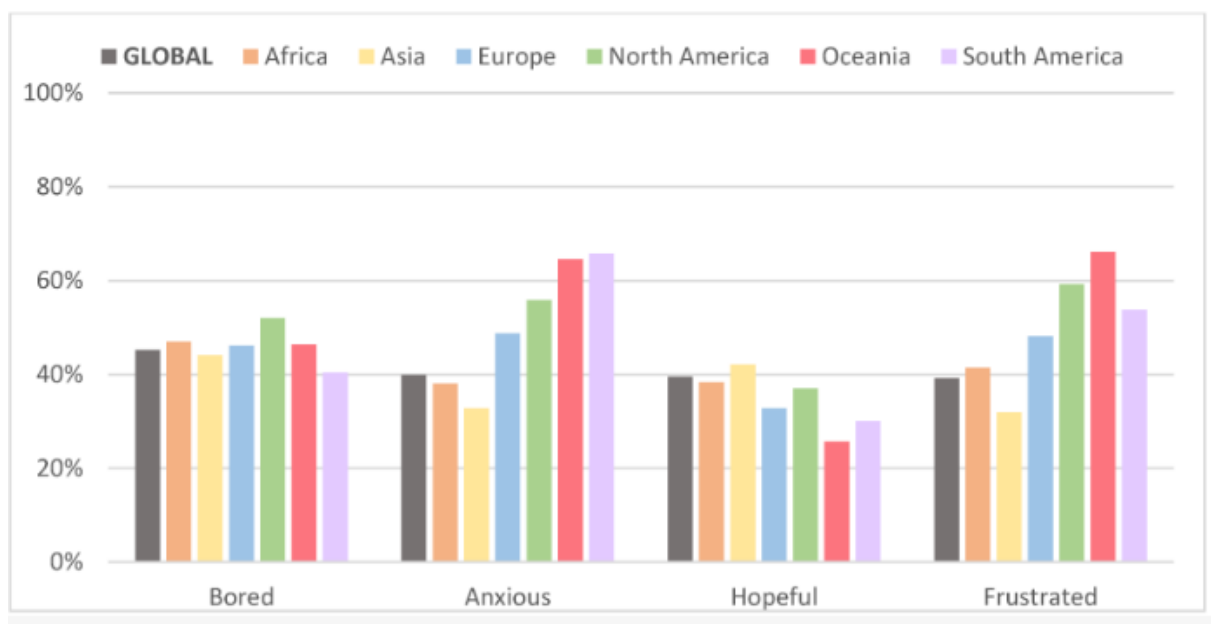
Figure 3 shows the emotions that students stated the most frequently during the COVID-19 epidemic (percent of students who frequently or always felt an emotion).

In order to ensure that students can complete their studies, institutions have had to create new teaching methods as a result of the COVID-19 pandemic, which has interrupted legal education everywhere. While hybrid and online learning environments have benefits, they also have drawbacks. To ensure that they give students the best learning experience

possible, schools must carefully weigh the advantages and disadvantages of different approaches.

Figure 4 shows the percentage of students who reported personal concerns frequently or always throughout the COVID-19 epidemic.
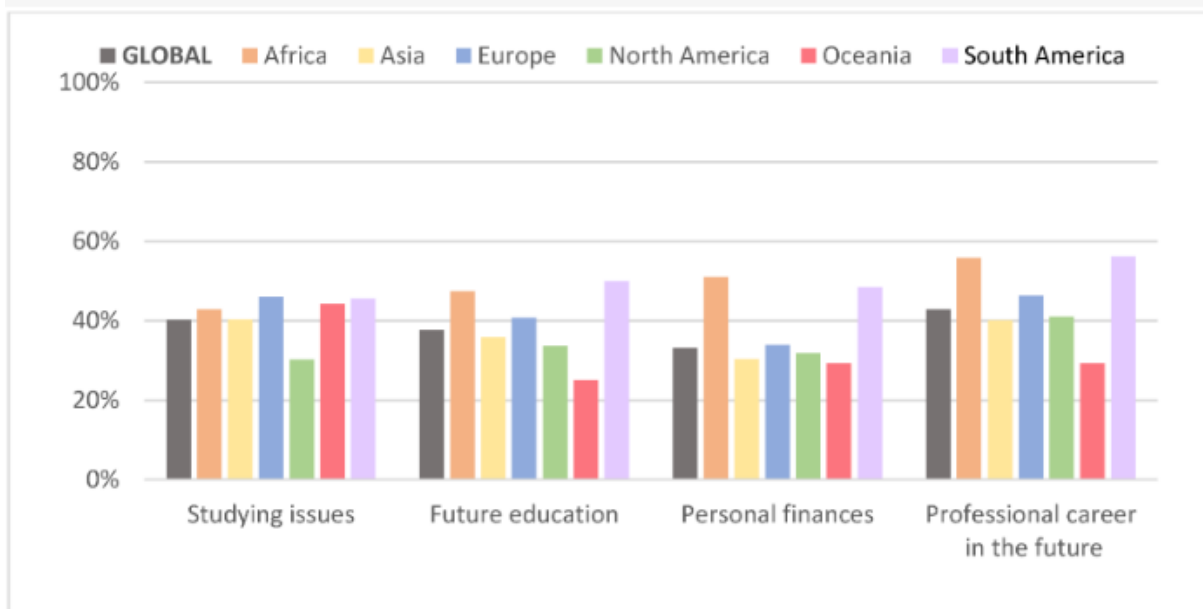
Figure 5 shows the percentage of students that were satisfied or extremely satisfied with the role that specific institutions played during the COVID-19 outbreak.
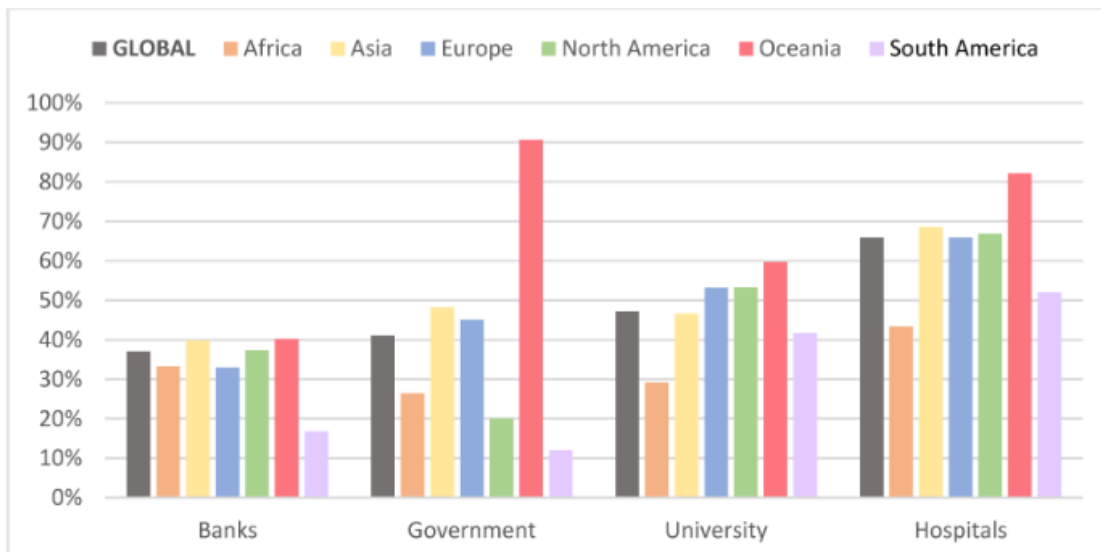
Discussion

It is undeniable that the COVID-19 epidemic has disturbed the traditional educational system and has sped up the use of online and hybrid teaching strategies in legal education. The pandemic has brought to light the necessity for academic institutions and legal bodies to create novel and adaptable approaches to legal education that embrace technological advancements while upholding the integrity of the discipline.

Additionally, the results of the study indicate that developing faculty members is crucial for supporting online and hybrid education. In order to support students in gaining real-world experience and professional abilities, faculty members must become accustomed to new technological tools, learn how to design interactive, engaging online courses, and adapt to these changes in technology. For this reason, universities and legal organizations must offer faculty the proper training and development opportunities in order to guarantee the successful delivery of online and hybrid courses.

The study also cites various drawbacks of online learning, such as little interaction and engagement, which may harm students' learning outcomes. Universities and legal institutions must therefore create online courses that encourage communication, cooperation, and participation in order to provide students with the hands-on training and professional skills they need.

The study comes to the conclusion that by fusing the benefits of both traditional and online learning, hybrid models have tremendous potential to improve legal education. Students may benefit from hybrid models by having the chance to get real-world experience, refine their professional abilities, and improve their academic results. But for hybrid models to be successful, rigorous planning and coordination, efficient technology use, and sufficient funding and support are all necessary (American Bar Association, 2021).

As a result, universities and legal institutions need to give priority to creating hybrid models that will improve legal education after the epidemic while maintaining its integrity. The best of both worlds can be offered to students through hybrid models, giving them the chance to interact with teachers and peers in a traditional classroom setting while simultaneously taking advantage of the adaptability and accessibility of online learning.

There are, however, certain drawbacks to the study, including the scarcity of empirical research on the efficacy of hybrid models in legal education and the scant information on the pandemic's long-term effects on legal education. Future studies should examine how the epidemic has affected legal education over the long run and evaluate how well hybrid educational models have performed. As a result, universities and legal institutions will be better equipped to devise strategies that will satisfy the changing demands of both students and the legal profession. This will also give significant insights into the future of legal education.

Conclusion

Traditional legal education systems have been severely disturbed as a result of the COVID-19 epidemic, which is still affecting society worldwide. Universities and legal institutions all around the world have been compelled to adapt to new online and hybrid teaching methods in order to maintain the continuity of providing their students with a high-quality education. The epidemic has caused a change in the educational landscape, increasing the use of online and hybrid models and necessitating that institutions come up with solid plans for delivering high-quality legal education while maintaining the integrity of the profession.

According to a study on the effects of online and hybrid learning on legal education, online learning has some benefits, including flexibility, accessibility, and cost-effectiveness,

allowing students to learn at their own pace and convenience, regardless of where they are physically located. It does have drawbacks, too, such as restricted engagement and interaction, which might harm students' learning outcomes. Additionally, a robust technology infrastructure and technical assistance are needed for online learning to be successful in order to guarantee seamless course delivery.

Online and traditional teaching approaches are combined in hybrid models, which have arisen as a viable remedy for the drawbacks of online education. Increased involvement, accessibility, and flexibility are just a few advantages that hybrid models may be able to provide while still upholding the integrity of legal education. The study discovered that hybrid models give students the chance to get real-world experience and hone their professional skills.

However, putting into practice a successful hybrid approach necessitates careful preparation and cooperation. Universities and legal institutions must create methods to guarantee that the delivery of online and conventional components is smooth and that the learning objectives are satisfied. The success of hybrid models also depends on their ability to employ technology effectively. Examples of this include learning management systems, virtual classrooms, and video conferencing.

The study suggests that in order to improve legal education post-pandemic, universities, and legal institutions should top priority to the creation of hybrid models. In order to guarantee that teachers have the ability to give high-quality instruction using hybrid models, faculty development and training are equally crucial. To enable the successful delivery of online and hybrid courses, schools must also make investments in a sound technological infrastructure and offer technical support.

Universities and legal institutions must quickly embrace new teaching techniques as a result of the COVID-19 pandemic. The study emphasizes the necessity for universities and legal institutions to give priority to the creation of hybrid models, which combine the best of traditional and online teaching methods, in order to deliver high-quality legal education while preserving the integrity of the profession (Chase & Hays, 2020). The success of hybrid models depends heavily on the efficient use of technology, faculty training and development, and technical assistance. Universities and legal organizations can maintain the high caliber of their legal education while adjusting to the shifting global environment by embracing hybrid models.

Acknowledgment

Finally, I would like to thank all of the study participants whose time and work helped to gather the information needed for this study. This work would not have been possible without their crucial contributions.

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The Professional Training of Postgraduate Students receiving Higher

Professional Education in the Stage Education System of the Eastern European Region

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Characteristics of the professional training of postgraduate students receiving higher professional education in the stage education system of the Eastern European region

Abstract

The purpose of this research was to investigate the features of postgraduate training in the Eastern European region's stage education system. The study's overarching goal is to better understand the components and variables that contribute to graduate student's professional development. This objective was reached through the use of a qualitative study method that includes a review of the relevant literature, in-depth interviews with subject matter experts, and an examination of the situation of professional education for Eastern European graduate students today. The findings highlight the importance of elements including program quality, faculty expertise, resource accessibility, and student support in determining the success of postgraduate students' professional development. The study also shows that there are several problems with the current Eastern European system of stage education, including a lack of resources, poor facilities, and antiquated teaching methods. According to the study, Eastern European postgraduate students' professional training needs substantial upgrades to meet labor market demands and regional economies' competitiveness. The research shows that strengthening the quality of educational programs, improving student resources and support, and encouraging collaboration between academics and industry can all help to better prepare postgraduate students for careers in their fields.

The keywords

1. Stage Education

2. Professional education training

3. Eastern European Region

4. Higher education for professional postgraduate

Introduction

Background of the study

There has been a rising need for highly qualified workers across several industries in recent years. In response to this need, many nations have established higher professional education programs to prepare postgraduate students for careers in various disciplines. Stage education has also witnessed radical transformations in recent years, and the Eastern European region is no exception. Considering these shifts, researchers in Eastern European education believe it is important to investigate the nature of postgraduate students' training as they pursue higher professional degrees. This is crucial for the region's economies to be globally competitive since it will help them produce the trained workers the market needs. Improving the efficiency of the Eastern European stage education system requires a deeper understanding of the elements that influence the quality of professional training (Melnyk et al., 2019).

Research problem and objectives

The problem for study: Regardless of introducing higher professional education programs into the Eastern European region's stage education system, little is known about the nature and influence of postgraduate students' training.

Objectives

1. This research aims to determine the most salient aspects of postgraduate training in the Eastern European region's stage education system.

2. The purpose of this research is to analyze what influences the quality of postgraduate education in Eastern Europe.

3. To assess the quality of postgraduate education in Eastern Europe at present.

4.   The goal of this study is to offer suggestions for enhancing the quality of postgraduate professional education in Eastern Europe.

Significance of the study

There are many reasons why it is important to examine the professional training of postgraduate students in the Eastern European region's stage education system. First and foremost, the research will add to the existing body of knowledge on graduate education in Eastern Europe. The study will shed light on the current situation of the regional theater education system by illuminating its major features and the factors affecting the quality of this training. Those in positions of power and influence in the field of education concerned with elevating the standards of higher professional education in the region will find this information very useful.

Second, the research will shed light on the difficulties encountered by the theater education system in Eastern Europe. The study will assess the quality of educational programs, the credentials of faculty, the availability of resources, and the level of assistance given to students to determine what areas of professional training need to be enhanced. Policymakers and other education stakeholders concerned about the problems plaguing the theater education system will find this material helpful. Finally, the research will suggest ways better to prepare graduate students in Eastern Europe for the workforce. The study will give a road map for enhancing the efficiency of the regional stage education system by identifying ways to improve the quality of educational programs, provide better resources and support for students, and foster collaboration between academia and industry. Findings from the investigation will shed light on the current climate of professional training and the obstacles confronting the educational stage system (Melnyk et al., 2019). Suggestions for enhancing the standards of professional training for postgraduate learners throughout the region will be provided.

Overview of professional training for postgraduate students

Postgraduate students need access to professional training to acquire the specialized expertise and knowledge that modern careers need. The process of getting scholars ready for the workforce, academic pursuits, and positions of leadership in their industries. Coursework, research, internships, and fieldwork are only a few components that make up a graduate student's professional education. Higher professional education programs have emerged in recent years to address the rising need for highly qualified professionals in various economic fields. Changes have been made to higher professional education programs in Eastern Europe, emphasizing more hands-on, marketable skills.

Margaryta Yakovenko and Olha Bielova found that graduate students in Eastern Europe place a premium on study findings, internships, and practical experience in their educational experiences. They point out that students should work on research projects and intern to obtain experience in the real world. The study also emphasizes the value of university-industry partnerships in preparing students for the workforce (Melnyk et al., 2019). Olga Oleksiyenko and Serhiy Kurbatov discovered through another study that the skills and experience of the faculty members, the readily accessible resources, and the relevance of the curriculum all contribute to the quality of vocational education for postgraduate students in Ukraine. According to the research, upgrading the curriculum to reflect the evolving needs of the labor market and investing in the professional development of the teaching staff are both essential to raising the bar for professional education in the region (Hart, 2018).

In Eastern Europe, postgraduate students' access to professional training is crucial to the success of the higher education system. To create highly qualified individuals who can satisfy the needs of the labor market, it is essential to place emphasis on hands-on training, research, and engagement with the industry. However, several issues might affect the quality

of professional training, and this training must be continuously improved to guarantee that graduates have the necessary skills and knowledge.

Key Features and factors affecting professional training in Eastern Europe

Key Features of Professional Training

Practical experience and internships play a significant role in educating Eastern European postgraduates. According to research by Tam et al., 2020, students can better put their academic knowledge into practice through hands-on experience. Research is also integral to professional education because it helps students learn about and excellent analytical abilities relevant to their chosen sector (Markova, 2019). The Eastern European emphasis on multidisciplinary education as another distinguishing element of professional training in the region. Markova (2019) discovered that educating students in heterogeneous and complicated work contexts necessitates an interdisciplinary education. Success in any sector requires diverse skills and information, all of which can be gained through an interdisciplinary education (Hart, 2018).

Factors Affecting Professional Training

The caliber of the teaching staff is a major issue in Eastern European countries. According to Tam et al., 2020 research, the faculty's level of expertise and professionalism makes a big difference in the standard of education students receive. Schools need to hire qualified tutors to provide students with useful information, skills, and direction. The accessibility of resources is another element influencing the quality of professional education in Eastern Europe. According to research by Tam et al., 2020, the standard of professional education is greatly affected by access to facilities and tools. For schools to give their students the hands-on experience they need to grow professionally, they must have access to sufficient resources (Melnyk et al., 2019).

Current Challenges and Trends in the state education system in Eastern Europe

Eastern Europe's theater education system must adapt to new global norms and deal with several pressing problems. The world is changing so quickly that one of the biggest problems is updating the system to keep up with it. Changes in the technological landscape and the nature of the workforce necessitate an openness to new methods of instruction and learning. Quality assurance and accreditation are other obstacles that must be overcome. Many countries in Eastern Europe are aiming to improve the quality of their educational systems by strengthening their accrediting systems. Accreditation should also be based on objective criteria rather than subjective factors, and corruption issues should be addressed (Mamurov, 2017).

Internationalization of the stage school system is a current trend in Eastern European countries. International students and exchange programs are a focus for many schools because of the benefits they can provide to the educational system. Interdisciplinary learning is also gaining popularity since it helps students prepare for the complicated, multidisciplinary workplaces they'll eventually enter. Finally, due to the dynamic nature of the labor market and the necessity for individuals to continuously update their skills and knowledge, there is an increasing emphasis on the lifelong acquisition of knowledge and continuing education. One way to achieve this goal is to create education programs that are adaptable and modular so that students can study when and where it is most convenient for them (Winterton, 2017).

Methodology

Research design and approach

This study uses a qualitative case study methodology. This method was selected because it provides a comprehensive analysis of the features of graduate students' professional training in the Eastern European region's theater education system. Throughout this study, we will use the case study technique to examine a range of postgraduate education

programs throughout Eastern Europe. This study's data will be gathered by a review of relevant literature and through interviews with postgraduate students, faculty, and administrators in Eastern European institutions of higher professional education. The interview data will be evaluated using thematic analysis, which entails looking for overarching themes or patterns that provide insight into the research questions. This research will take a deductive method, verifying previously formulated hypotheses and theories through analysis of the available literature (Melnyk et al., 2019).

Sampling and data collection methods

Purposive sampling will be used to select participants for this investigation. This strategy entails recruiting people who have unique insights into the study's area of study. Eastern European graduate students, faculty, and administration in professional higher education will make up the study's sample (Kintu, Zhu & Kagambe, 2017). The sample will be chosen based on their expertise in matters about the specifics of graduate students' experiences in the Eastern European theater industry's approach to higher professional education (Melnyk et al., 2019).

Data analysis procedures

Thematic analysis will examine the information gathered from the literature study and the semi-structured interviews. Data themes can be found, examined, and reported on with the help of a flexible and iterative method known as thematic analysis. Here are the actions that will be taken throughout the analysis: Knowledge of the information: Transcribing the interviews and reading through the literature review numerous times will help the researcher fully grasp the facts. The study goals will inform the first coding of the data. These first codes will be formed by searching for commonalities and emerging themes in the data (Winterton, 2017).

As new data is gathered and examined, the previously established themes will be revisited and revised. NVivo or another qualitative analysis program will be used for the analysis. The study's findings will provide light on the nature of postgraduate students' professional training as they navigate the higher professional education offered by the Eastern European region's theater education system.

Results and discussion

The current state of professional training for postgraduate students in Eastern Europe
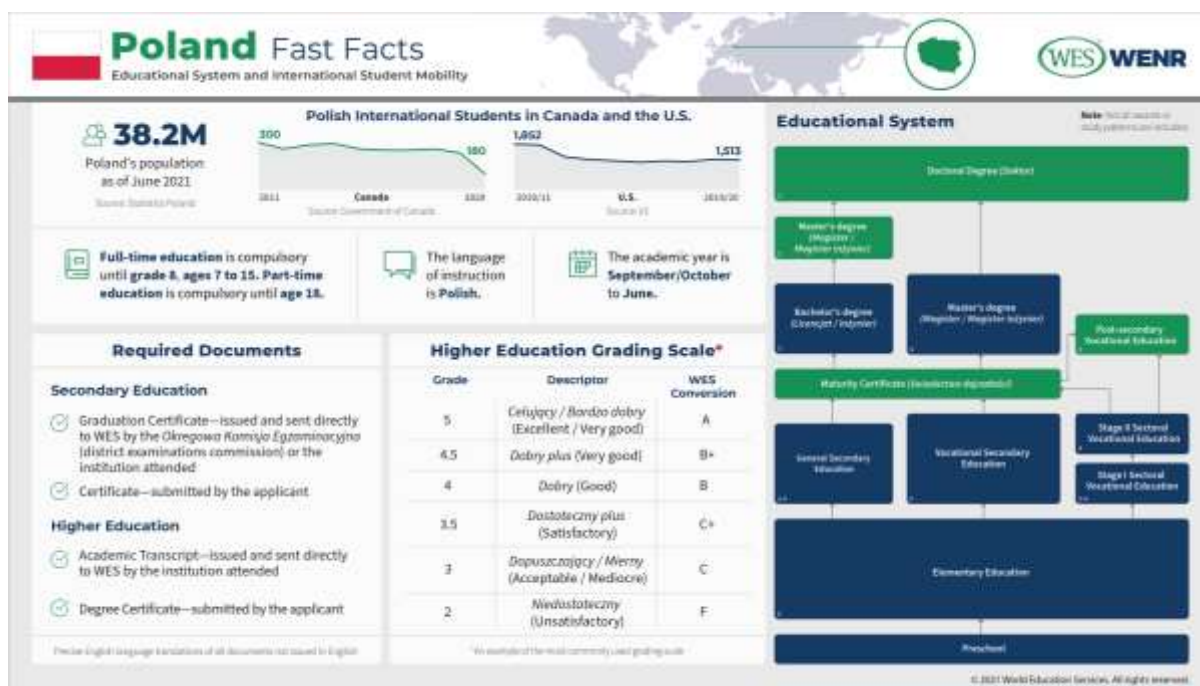
Several elements, including the economy, politics, and society, affect the current level of professional training for postgraduate students in Eastern Europe. Because of these considerations, professional development courses in the area have had to adapt or suffer. According to the research, graduate students in Eastern Europe benefit from an education system with high academic rigor that helps them get started in highly specialized professions. However, there are considerable obstacles to postgraduate students' professional training, such as a lack of funding, out-of-date curricula, and inadequate opportunities for hands-on experience (Kintu, Zhu & Kagambe, 2017).

Several new tendencies in Eastern Europe's postgraduate students' professional training were also uncovered by the study. The bearing of transdisciplinary abilities is rising, and there is a greater emphasis on entrepreneurship and creativity in the classroom. As a result of these shifts, educational institutions in the area are revising their curricula better to serve the evolving requirements of the labor force. The research also found several elements that influence the standard of education for professionals in the region. Resources, instructors, curriculum, industry relevance, and the depth and breadth of students' hands-on experience all play a role. The study indicated that schools placing a premium on these elements tend to turn out graduates more equipped to compete in the workforce. The results of this study show that more work has to be done to increase the value of postgraduate education in Eastern Europe. Institutions can better equip students for professional success and regional development if they adapt to changing times and solve the problems that plague professional training (Winterton, 2017).

Key findings on the characteristics of professional training for postgraduate students

The study's findings highlighted numerous crucial features of postgraduate students' professional training in the Eastern European region's theater education system. Among these features are: The Eastern European theater education system places a premium on academic achievement, as seen by the extensive coursework required for postgraduate degrees in the region (Kintu, Zhu & Kagambe, 2017). Students will be well-prepared to enter their chosen fields because of the emphasis on academic performance.

The study indicated that postgraduate students in Eastern Europe typically had limited access to practical training possibilities, notwithstanding the region's renowned academic rigor. This is due to several causes, chief among them being inadequate funding and outdated

course materials. To combat these issues, educational institutions must expand students' access to experiential learning opportunities (Kintu, Zhu & Kagambe, 2017).

Application of technology and e-learning platforms were cited as examples of new teaching methods used by Eastern European schools to improve the standard of professional education for graduate students. The significance of multidisciplinary abilities is on the rise, and this is reflected in postgraduate education in Eastern Europe. Universities now realize that graduates need a diverse set of abilities to thrive in the workforce. Ultimately, the study indicated that postgraduate training programs in Eastern European institutions are increasingly emphasizing entrepreneurial and innovative practices. The necessity of creating graduates who can aid regional economic growth and development motivates these efforts. These results, taken as a whole, shed light on how graduate education in Eastern Europe differs from the norm. Institutions can better equip students for professional success and regional development if they consider and adapt to each area's unique difficulties (Winterton, 2017).
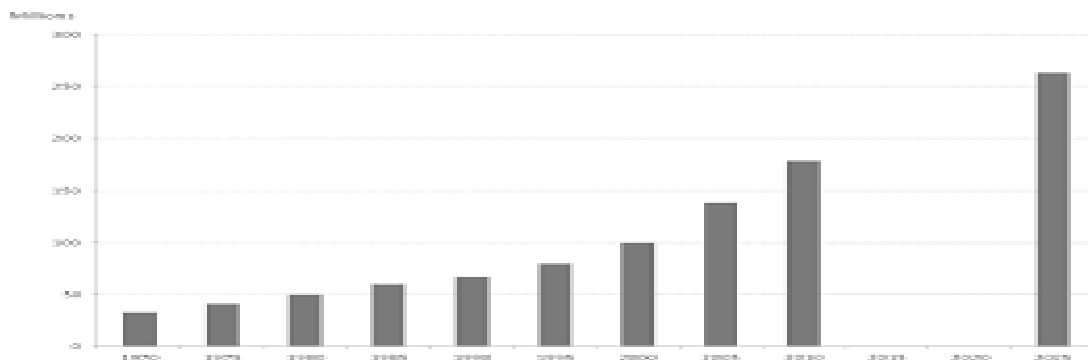
Discussion of the factors that affect the quality of professional training

There are several elements that affect the caliber of postgraduate training in Eastern European stage schools. The quality of professional training can be affected by several variables, including those listed below. Regarding professional education, one of the most important criteria is the caliber of the teaching staff. A strong educational foundation begins with a faculty that is knowledgeable and committed to helping its students succeed. Schools

in Eastern Europe need to hire qualified teachers committed to their student's success if they want to compete internationally.

The curriculum's design is crucial in establishing the caliber of professional education. A well-crafted curriculum should be revised regularly to adapt to the changing demands of the labor force and state of the art in the field. To guarantee that students in Eastern Europe obtain cutting-edge education, universities, and colleges in the region must update their curricula to incorporate more hands-on learning experiences and multidisciplinary approaches. Inadequate finance and restricted access to contemporary facilities and equipment are only two of the many obstacles that Eastern European institutions must overcome to provide high-quality professional training to their students. To improve the quality of education for postgraduate students, institutions must address these difficulties by forming collaborations with industry stakeholders and policymakers (Kintu, Zhu & Kagambe, 2017).

The composition of the student body can also have an effect on the standard of an institution's professional development programs. Institutions should encourage diversity by making sure all students, regardless of their socioeconomic status or cultural background, have access to an excellent education. Subsequently, collaborations with industry stakeholders can aid schools in bettering the quality of professional training by exposing students to current industry practices and giving them hands-on experience in their field of study. Furthermore, internships, apprenticeships, and full-time jobs for graduating students can be made available to more students if educational institutions and businesses work together. Generally, a holistic approach that considers these aspects is necessary to improve the quality of professional training for postgraduate students in Eastern Europe. Institutions can better equip students for professional success and regional advancement if they meet these problems head-on.
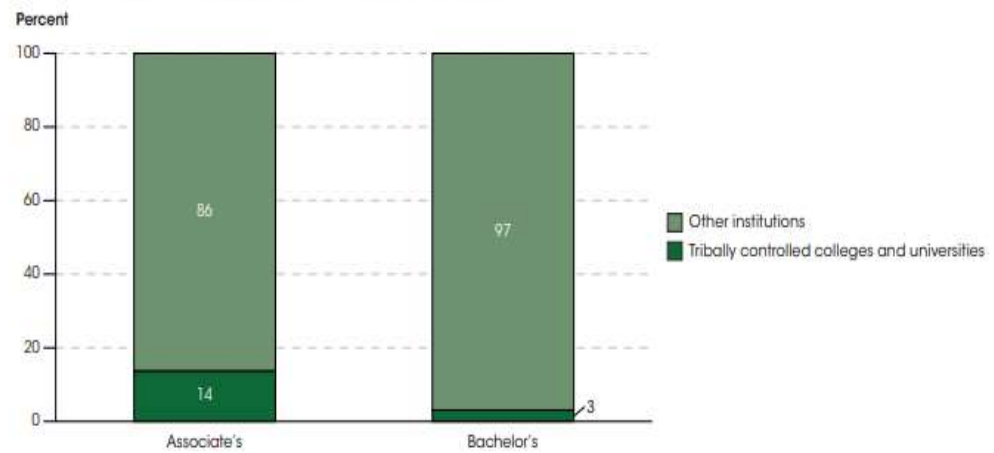
The chart below shows the level of degree

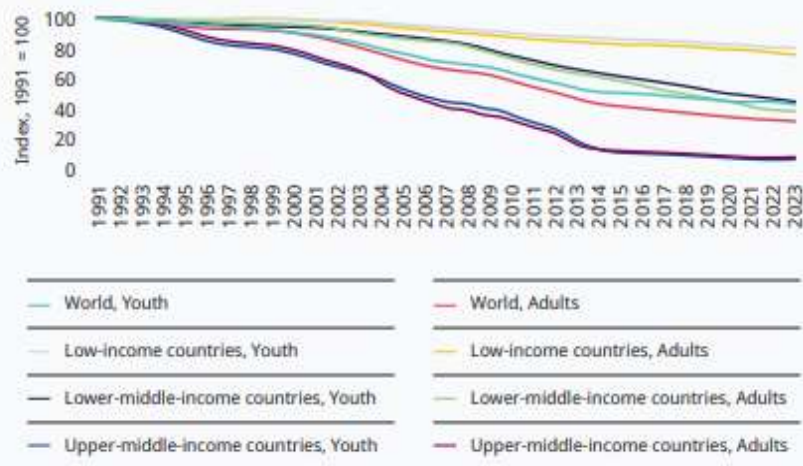
Percent
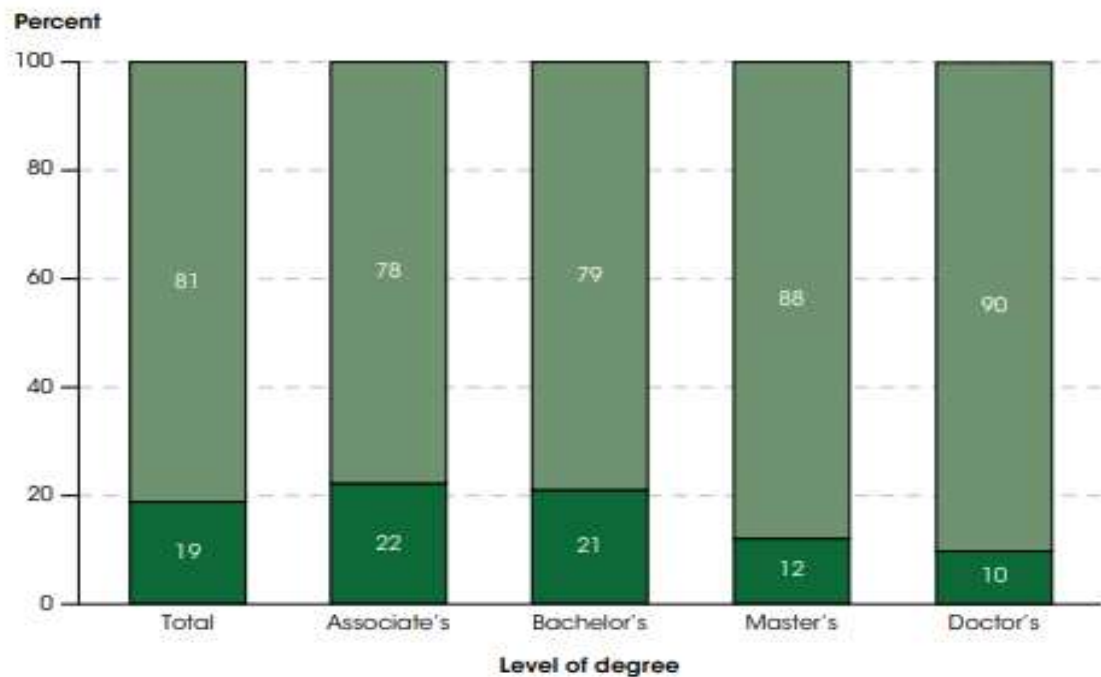
Summary of the main findings

In summary, this research analyzed the features of graduate students' professional training in the Eastern European region's theater education system. Several criteria, such as faculty quality, curriculum design, availability of resources, student diversity, and industry relationships, were shown to influence the current level of professional training in Eastern Europe. The study's major findings suggest that Eastern European institutions should work to resolve the identified problems to provide better professional training for postgraduate students. This can be done by working with business leaders, government officials, and other organizations and regularly revising curricula to incorporate more hands-on learning experiences and multidisciplinary perspectives.

The chart below shows comparison on Bachelors degree and associates in University.

Figure B.6. Percentage distribution of associate's and bachelor's degrees conferred to American Indian/Alaska Native students, by institution type: Academic year 2015–16

Percent

- Other institutions
- Tribally controlled colleges and universities

Associate's: 86 / 14
Bachelor's: 97 / 3

Working poverty (extreme and moderate) among young people and adults, global and by country income group, 1991–2023 [index = 100 in base year, 1991]

- World, Youth
- World, Adults
- Low-income countries, Youth
- Low-income countries, Adults
- Lower-middle-income countries, Youth
- Lower-middle-income countries, Adults
- Upper-middle-income countries, Youth
- Upper-middle-income countries, Adults

Implications for Policy and Practice

The results of this research have important implications for both policy and practice in Eastern Europe. The following suggestions are based on the problems found: Institutions should put resources toward improving the quality of their professors by actively seeking out and hiring individuals with advanced degrees and extensive relevant experience. To

guarantee that students are learning skills that are applicable in the real world, institutions should update their curricula to include more practical training opportunities and multidisciplinary methods. Enhance the accessibility of resources like money, modern facilities, and equipment by encouraging institutions to form collaborations with industry stakeholders and policymakers. Institutions should encourage inclusion by ensuring that all students, regardless of their socioeconomic status or cultural background, have access to an excellent education (Kintu, Zhu & Kagambe, 2017).

Institutions should establish relationships with industry stakeholders to give students exposure to current industry practices and real-world experience in their field of study. Schools, governments, and industry players can work together to implement these suggestions. Institutions can enhance the professional training of postgraduate students, boost their potential for employment, and aid regional development by addressing the listed concerns.

<div align="center">**Limitations of the study and recommendations for future research**</div>

There are a few caveats to the study that must be considered. First, the scope of the study was restricted to Eastern Europe, therefore the results may not generalize to other regions. Additionally, the study excluded the opinions of industry stakeholders and policymakers in favor of those of graduate students and academics. To overcome these constraints, more study into the views of industry players and policymakers on the standard of postgraduate professional education in the region is warranted. In addition, research might be carried out in other areas to compare and contrast the results with those from Eastern Europe. Last but not least, a bigger sample size can be used in subsequent studies to boost the findings' generalizability. In summary, this research contributes significantly to our understanding of the nature of graduate education in Eastern Europe. However, more study is

needed to fill in the gaps and illuminate the factors influencing the standard of professional education in the region (Kintu, Zhu & Kagambe, 2017).

Conclusion

The study concludes with an in-depth investigation of the features of professional training for graduate students in the Eastern European regional stage education system. Lack of practical training opportunities, poor finance, outmoded curricula, and a lack of skilled professors are only some of the issues and factors found by the study that affect the efficacy of professional training. The merits of the stage education system are also highlighted in the survey, such as the importance placed on research, interdisciplinary methods, and the fusion of academic and practical understanding. The research also includes suggestions for enhancing professional education, such as hiring more qualified instructors, updating curricula, broadening students' access to relevant materials, fostering a more welcoming environment, and fostering stronger ties to the business community (Melnyk et al., 2019). In sum, this research adds to the body of knowledge on Eastern European professional training and sheds light on the elements that shape the quality of graduate education in the region. Institutions can boost regional development and progress by applying solutions to the problems we've identified and implementing our suggestions for how to better deliver professional training.

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Promoting Innovative Advancement In The Digital Literacy Of Vocational Education

Institution Teachers

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Abstract

The innovative development of digital literacy among teachers in vocational education institutions is crucial to ensure equal opportunities and access to the labor market. However, a lack of qualified personnel with digital skills remains a hindrance to further digitalization in vocational education institutions. This study employs a desk research strategy to investigate the issue of innovative development of digital literacy of teachers of vocational education institutions. The data collected through the desk research approach was presented in the form of a literature review. The literature review aimed to identify patterns, themes, and gaps in the existing literature to provide valuable insights into the research problem. The study emphasizes the need to promote broadband connectivity, train all sections of the population and provide vocational training. The COVID-19 pandemic has disrupted education and training, but also presented opportunities for innovation. The study highlights the importance of upskilling and reskilling, digital unemployment schemes, and helping the wider public upgrade their digital skills.

Introduction

Digital skills are crucial for the future of vocational education institutions. However, the lack of qualified personnel with digital skills remains a major obstacle to further digitalization. To address this issue, there is a need to invest in various sectors to train IT personnel and vocational education staff to create new teaching material and online platforms. In addition, it is important to promote broadband connectivity, train all sections of the population and provide vocational training.

Education and training are key principles in the development of innovative digital skills among teachers in vocational education institutions. Innovative digital skills among teachers are essential to ensure equal opportunities and access to the labor market. Therefore, all vocational education institutions should have access to quality and inclusive education, training, and life-long learning opportunities to acquire and maintain new skills that enable them to participate fully in their professions and manage transitions in the labor market successfully.

Innovative development of digital skills and education is essential for the future of vocational education institutions. It is important to address the skills gap by investing in IT personnel and vocational education staff, promoting broadband connectivity, and providing vocational training. Moreover, all vocational education institutions should have access to quality education, training, and life-long learning opportunities to develop innovative digital skills among teachers and ensure equal opportunities and access to the labor market

Rationale

In the realm of vocational education and staff training, the need for digital skills has become increasingly important for industrial transitions. This is evidenced by the establishment of new online platforms and courses aimed at equipping employees with the necessary skills. It has been widely

acknowledged that skills gaps and mismatches can hinder productivity, technological diffusion, and growth, and impact the resilience of stakeholders to economic shocks. In recognition of this, digital skills have become a central component of various training curricula, including those aimed at individuals seeking employment.

In recent times traditional learning and training methods has been disrupted, leading to the development of online platforms and courses aimed at providing students with general digital skills. These efforts aim to not only boost the digital skills of the population but also raise awareness of the opportunities and risks associated with digitalization. Consequently, many stakeholders have adopted a common strategy of educating for upskilling, reskilling, and digital unemployment schemes, as well as helping the general public upgrade their digital skills.

It is crucial to invest in developing the necessary skills and knowledge for the workforce to fully participate in the digital economy. Vocational education institutions must prioritize promoting broadband connectivity and training staff to create new teaching material and online platforms. Additionally, it is essential to ensure equal access to quality and inclusive education, training, and life-long learning opportunities for all individuals to enable them to acquire new skills that enable them to participate fully in the labor market and successfully manage transitions. Despite the challenges posed by the pandemic, stakeholders must continue to prioritize the development of digital skills to achieve sustainable growth and economic resilience.

Research Methodology

The present study employed a desk research strategy to investigate the issue of innovative development of digital literacy among teachers in vocational education institutions. Desk

research is a widely accepted research methodology used to gather information from various data sources to inform, advise, or contribute to a particular social problem. As defined by Toussaint et al. (2021) and Opatha (2020), desk research involves collecting both primary and secondary data, which could be qualitative or quantitative, to obtain valuable insights into a research problem.

The main research question of this study was, "What data literature, studies, and reports are available on the issue of innovative development of digital literacy of teachers of vocational education institutions?" To answer this question, the researcher used the desk research approach to collect data from online academic sources that were academically accepted as valid and reliable. The data collected was then used to conduct a secondary data analysis to offer expert advice, inform policy, and contribute to the ongoing social issue of innovative development of digital literacy.

The researcher employed various tools and equipment to conduct the desk research effectively. These included a laptop, internet connectivity, and access to programs such as Microsoft Word, Microsoft Excel, PDF readers, and academic sources in internationally recognized organizations such as OECD, EU, and government data. To find data, the researcher utilized search engines such as Google Scholar, JSTOR, Library of Congress, PubMed Central, Google Books, Science.gov, ResearchGate, and other relevant websites. The search was conducted using keywords such as digital skills, innovation, educators, education, competencies, technical vocational training, digitalization, technonogies , and institutions systems.

The data collected through the desk research approach was presented in the form of a literature review. The literature review involved a critical examination of the collected data, which included both qualitative and quantitative data. The review aimed to identify patterns, themes, and gaps in the existing literature to provide valuable insights into the research problem.

Results of the Literature Review

Digital Understanding

Digital abilities is frequently defined in crude terms, such as being able to use a mobile phone for basic transactions or to access and browse the internet, or, on the other end of the spectrum, the capacity to engage in computing and developing software. The term "digital literacy" refers to a deeper and broader idea that includes multiple competencies for using, managing, and creating digital tools and information. The amount of expertise in each of these competencies may vary between people. The capacity to use digital technology, create new applications, and find answers to novel issues will be at the higher end of the digital skills spectrum.

More and more jobs and industries need people with a variety of digital skills, rather than digital technology specialists or technicians. To drive the use of digital technologies as well as innovation, advanced digital literacy skills are necessary, while broad-based digital literacy skills at varying degrees of proficiency are required for the uptake of digital technologies across sectors. Additionally, persons employed in digital technology-related professions (from entry-level technicians to expert IT software and hardware engineers and programmers) need to possess specialized knowledge relevant to these fields. Those who have not been trained for the Technology vocations can gain extra specialized competencies thanks to the growing chances for lifetime learning and online learning. However, unlike the broader digital literacy skills, these competencies call for specialized training.

The term "Digital Skills Levels" is defined differently in various nations and reports. Although it is important for any institution to create definitions that are distinctive to its own

situation, it is also essential to compare such definitions against certain global norms to allow for accurate comparisons. In general, digital competencies for students, the general workforce, and the digital technology professions encompass several domains and competencies, necessitating the use of various frameworks that outline the necessary skills and competency levels.

Digital Skills are in Demand

A growing number of jobs will demand varied levels of competency in digital skills. As digital technologies grow more commonplace, these jobs will not just be in the conventional "digital technology sectors" but also in a variety of other businesses. Today any specialized personnel who comes out of any Vocational Educational institutions such as automotive and mechanical institutions, business institutions; cooking classes; medical colleges.

Findings on the demand of the vocational job market ins indicated below;
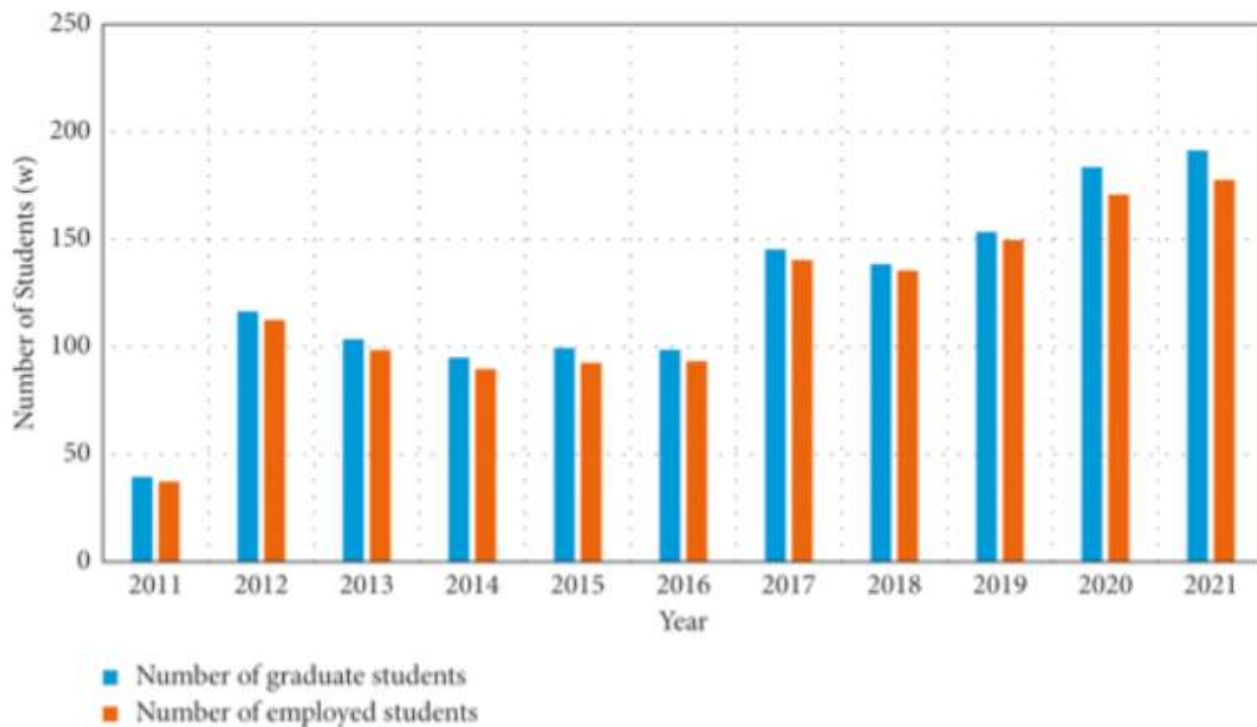
Source: Wang, (2022)

Both formal and informal public and private sectors will generate demand. This might be accomplished through a number of different channels, including frequent roundtable meetings between companies and the appropriate government agencies, analyses of the skills gaps in a given industry, searches of job postings on LinkedIn and other job boards, etc. Many nations regularly conduct labor force surveys, which, if well-designed, might be an important source of data for this reason.

The World Bank's Country Diagnostics on the Digital Economy has demonstrated that doing a thorough analysis of the need for digital skills in affluent countries like the United States of America is neither difficult or demanding. Frequently, the data is thorough and simple to comprehend. These World Bank publications include important data.

Relationship between Digital Skills, Teaching, and Training;
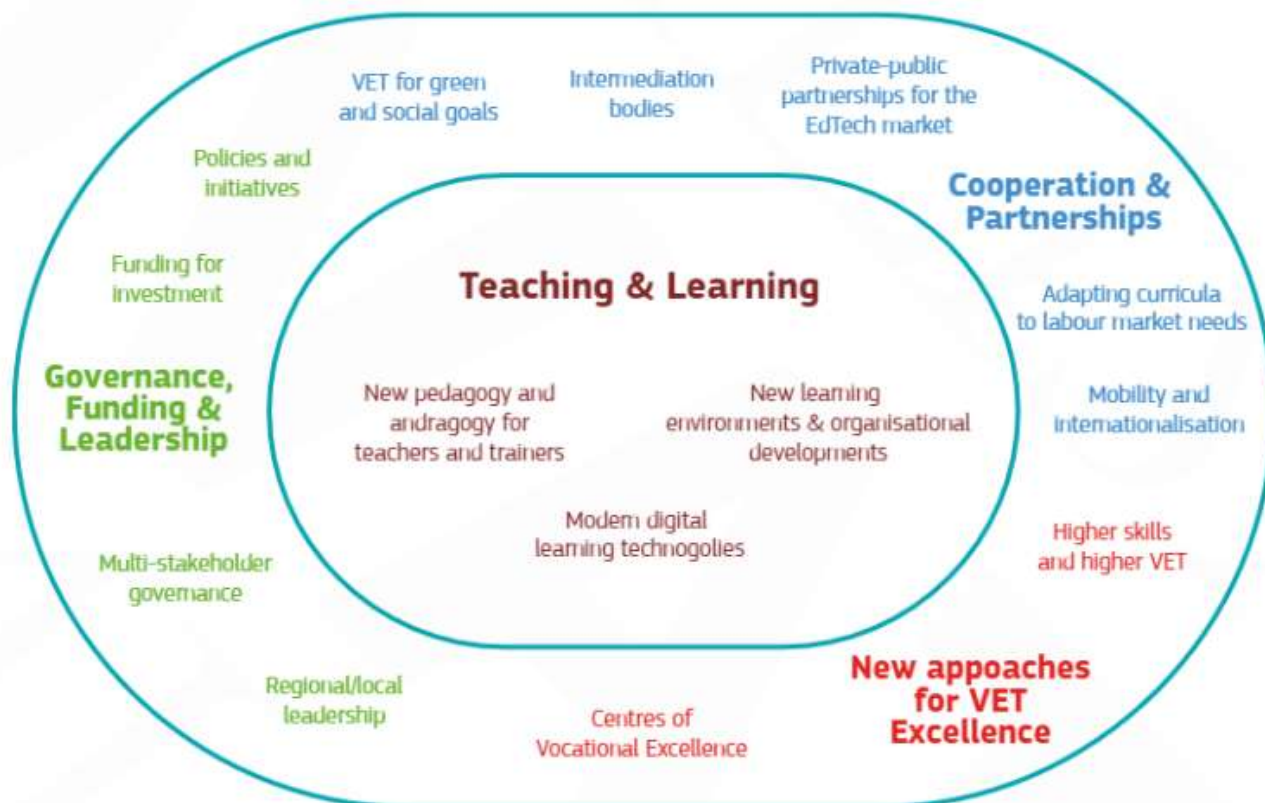
Source: European Commission, Directorate-General for Employment, Social Affairs and Inclusion, (2020) Report

Standards And the History of Teaching with Digital Competencies

The idea of digital competence was first introduced in a new vision of formal education that begins with the need to categorize the abilities and skills that a person must develop and maintain in order to succeed in school and, ultimately, in life. It is built on fundamental computer

abilities, such as how to use a computer to gather, assess, save, generate, present, share, and collaborate on information.

If we focus on the idea of "digital teaching competence," it is a type of multidimensional competence that can be characterized as the capacity to mobilize those skills and abilities that enable that you to search and critically select, obtain, and process relevant information using digital technology in order to transform it into knowledge, while also being able to communicate such information through the use of various technological and digital media, acting responsibly, and respecting the socially and ethically sensitive (EU report 2020).

The attainment of digital competencies is essential for professional success and career growth, which can be accomplished through innovative, critical, and secure utilization of information and communication technologies. The Common Framework comprises five competencies, which serve as a planning and evaluation tool for teacher training initiatives. The first competency encompasses the ability to recognize, access, organize, evaluate, and store digital information and data while assessing its relevance to instructional objectives. The second competency emphasizes collaboration and communication skills in digital environments, involving intercultural awareness, resource sharing, online community engagement, and networking .

The third competency involves the creation of digital material, including artistic works, multimedia, computer programming, and the integration and modification of existing information and content. The fourth competency is security, which includes responsible and secure usage of technology, safeguarding personal data and information, and protecting digital identity and content. Lastly, the fifth competency is problem-solving, requiring individuals to

apply technology creatively to address technical challenges and enhance their own and others' abilities to solve conceptual problems.

Teachers' digital competency Factors.

Teachers' digital competency is a multifaceted construct that is influenced by various factors. While age and gender have received the most attention in the literature, other incident factors that could influence the development of key digital abilities among teachers have also been explored. Previous teacher training is one such factor that has been found to positively impact the digital competencies that teachers possess (Habib et al., 2023). Specifically, if the teacher's training was technology-focused, it can enhance their proficiency in this area. However, the quantity of training courses does not necessarily translate into a higher level of competence, suggesting the need for quality over quantity in training programs.

Teaching experience is another factor that has been examined in the literature, with findings indicating that its impact on digital teaching competency varies. While experience can enhance proficiency, it can also hinder adaptation to new technologies. Newly-hired teachers may lack digital competence, but experience can improve it, emphasizing the need for lifelong learning in this domain. Educational level is also a major factor affecting digital teaching competency, with higher degrees associated with improved proficiency (Habib et al., 2023). Additionally, different education levels excel in different areas of competence, such as higher digital literacy in high school teachers, better communication and collaboration in primary schools, and higher content creation in early childhood education.

The professional background of teachers in technology-related areas can also influence their digital skills, with research suggesting that teachers in Computer Science and Mathematics

are the most proficient in this domain. In contrast, Physical Education and Mathematics teachers show the least interest in digital technology. Teachers in administrative science areas exhibit minimal usage of digital skills in their teaching practice. Subjective factors such as teachers' attitudes, digital technology assessment, interests, and preferences are critical determinants of their digital competencies, with the perceived need for digital training being the most significant factor in the use of technologies in the classroom. This emphasizes the importance of fostering a culture of collaboration and constructive approach to the teaching-learning process in enhancing teachers' digital competencies.

Overall, the development of teachers' digital competencies is a complex and multi-layered process that requires attention to various factors. The findings from this literature review suggest that targeted teacher training programs, ongoing professional development opportunities, and a supportive organizational culture that values digital competencies are essential to enhance teachers' proficiency in this domain. Additionally, a deeper understanding of the incident factors that influence teachers' digital competencies can help policymakers and educators design effective strategies to support teachers' continued growth and development in this area.

Role of digital technology In Digital innovation Development

Information and Communication Technologies have revolutionized social relations in recent times, transforming communication, coexistence, work, and education. The higher the level of digital technology proficiency, the greater the chances of obtaining quality and high-paying jobs (EU report 2020). In education, the use of technologies has several advantages, such as increasing student motivation, providing diverse learning resources, improving understanding and knowledge retention, and promoting attention to diversity.

However, the mere use of new technologies does not automatically improve the learning-teaching process. Instead, it is crucial to change the teaching methodology to fully benefit from technologies. This change entails modifying the teachers' curriculum and methodologies. Teachers play a crucial role in this techno-pedagogical transformation. They must perform new functions and tasks, not just transmitting information but also designing new learning environments and serving as tutors, counselors, and moderators. Thus, it is essential to have good teaching practices with technologies.

Although teachers need high-quality digital-pedagogical training to effect this change, educational research programs can leverage existing resources. Adequate teacher training is critical to effectively integrate the use of technologies in the classroom. Understanding the factors that affect the acquisition of digital teaching competencies is crucial for designing effective methodologies and promoting continuous teacher training plans in schools, taking into account the existing differences between these factors.

Importance of vocational training in shaping employment policies

The importance of vocational training in shaping employment policies cannot be overstated. Technology transfer between businesses and schools is critical for optimizing resources and making professions more competitive and inclusive. To achieve this, vocational training must be bilateral, involving both parties. Professional formation teachers have experienced significant changes in their practices over the past 25 years, and they have adapted to double training   training, just as they have in the past with other transformations.

Teacher   Vocational Training is a teaching mode that involves two different places: a training center and a company's work center, where theoretical training and practical skills are

complemented. Both the teaching center and the work center are involved in the training and evaluation process. In this mode, the teacher plays a vital role in imparting digital skills to students to ensure they are equipped to meet the demands of the modern workforce. This is crucial for individuals with special needs who require tailored training to ensure they acquire the necessary digital skills to succeed in their chosen fields (Habib et al., 2023). As such, it is essential to create an inclusive learning environment that accommodates the unique needs of each student, irrespective of their ability levels

A crucial aspect of double training   training is the involvement of companies in the development of the training program. However, studies show that only a small percentage of companies have contributed to the curriculum or have done so minimally, which goes against the essence of double training   training. In order for double training   training to be successful, a collaboration between the educational and work centers is essential, especially when it comes to the digital competency development of teachers, and must be geared towards innovation and change through the effective use of digital technology. This is particularly important since the educational and work centers operate on different schedules and at different paces, and bringing them together requires a concerted effort.

Teacher   vocational training necessitates:

(a) Strong compliance monitoring to guarantee optimal training in the company.

(b) Implementation of a rigorous student assessment process and development of a network of collaboration between schools and businesses.

(c) Enhancing mentoring in both academic institutions and workplaces, thereby making it vital to improve career and academic counseling through specific training courses that include digital

literacy. Improving the digital competencies of teachers in both the school and the workplace is crucial.

In today's scenario, where digital transformation is driving most of the changes in various current and future jobs, it is crucial to educate the future professionals in this field with digital literacy to meet current and future job market demands. Furthermore, in the double training model, technologies become even more critical because of the lesser presence of students in the classroom, necessitating the use of new technologies by mentors to track students.

Given the growing number of students in double training   vocational training in recent years and the increasing number of teachers in this teaching modality, along with the paucity of research on the topic, this research can aid present and future teachers in comprehending the elements of a methodology that relies on information and communication technologies.

Findings and Discussions

Role of digital technology Skills and Competency in Digital innovation Skills

In recent years, the use of technologies in education has become increasingly important as they provide teachers with tools to motivate students, personalize learning, and enhance knowledge assimilation. Thus, teachers' digital skills and competency have become a challenge to address in the educational community. The teacher is crucial in transforming the teaching process by launching new practices based on digital technology, taking on the role of a facilitator and advisor to their students, and performing functions such as tutor, moderator, and counselor.

In vocational education, the integration of digital technology resources is essential, as it is necessary to prepare future professionals for the challenges they will face in the labor market's digital transformation. The main objective of this study was to examine double training vocational training teachers' self-perceived level of digital competence and whether sociodemographic factors influenced their development of these perceptions.

The results of the study showed that double training   vocational training teachers' digital skills are similar to those of other educational stages, but they are below what would be necessary for optimal teaching with digital technology resources. The study suggests that teachers are not yet able to integrate technologies into the classroom or do not have the necessary training to make optimal use of them. This highlights the need for further training and professional development for teachers in the use of technologies in education.

The role of digital technology skills and competency in digital innovation skills is crucial in today's educational landscape. Teachers play a vital role in this transformation, and their mastery of digital skills is essential to improve teaching quality and preparing future professionals for the challenges of the digital age (Habib et al., 2023). The study shows that more efforts are needed to train and develop teachers' digital skills to ensure optimal use of technologies in the classroom.

Upon analyzing the sociodemographic factors that influence the development of digital competencies, the findings of this study revealed that population size plays a significant role in the level of communication and collaboration among teachers in this stage of education. Municipalities with smaller populations exhibited higher levels of collaboration among teachers, owing to the fact that their networks are more tightly-knit.

The study also discovered that previous educational attainment has an impact on teachers' self-perceived level of digital security. This is consistent with previous research that suggests that prior training is a crucial determinant in developing digital competencies. However, unlike other studies, this research also revealed that not having a higher level of academic study actually leads to greater digital prowess. Those population sets with higher academic achievement were not significant in the model configuration, unlike the set of teachers that showed a dependency relationship.

Another factor that was found to be crucial in developing digital competencies was previous digital technology training. This research established a clear relationship between prior digital training and knowledge about digital resources, which in turn promoted better problem-solving abilities when dealing with technological challenges.

The teacher is a significant factor in problem-solving, with all official professors showing significant differences in their responses. In contrast, the settings established by interim teachers were found to have an impact on the development of digital content (Habib et al., 2023). This supports the possibility that younger teachers or those with permanent jobs may be better equipped to adapt to technological immersion.

This study highlights the importance of various sociodemographic factors in the development of digital competencies among teachers. Factors such as population size, educational attainment, prior digital technology training, and teacher category all play crucial roles in determining the level of digital proficiency that teachers possess. By taking these factors into account, policymakers and educators can work towards developing effective training programs that help teachers build the necessary digital competencies to thrive in the modern classroom.

Importance of Teachers' Knowledge of Digital Skills

It cannot be denied that teachers' digital knowledge is crucial in today's world as the integration of new technologies in teaching leads to more flexible, collaborative, and dynamic teaching models. To ensure that technonogies are truly effective in teaching, teachers must have both instrumental and pedagogical digital training. Access to training programs that make technological resources truly useful is essential for quality digital skills training in both initial teacher training and lifelong learning.

In Teacher Vocational Training, digital teaching skills are particularly important because collaboration between schools and workplaces is essential and significantly improves with the use of technologies by teachers in both fields. Additionally, digital knowledge is crucial in double training education to keep optimal track of students as they have less face-to-face presence in classrooms than in other models.

Numerous vocational education programs and regions have implemented innovative learning tools and platforms to digitize education and skills. However, the quest for better online services and resources to improve the digital experience in skills education remains ongoing. It is essential to continuously innovate in digital skills and develop new online materials to avoid digital fatigue.

The digital divide is a significant concern in terms of age, gender, disability, social status, wealth, and ethnicity, resulting in a two-tier profession and increased social exclusion. Addressing these disparities is critical and requires immediate action. The territorial dimension of the digital divide is another aspect that needs attention. Regions with unique geographical features, such as peripheral, insular, and cross-border areas, as well as mountainous and

depopulated regions, have limited broadband provision and digital skills development, which impedes their progress. Additionally, the growing digital gap between urban and rural areas presents a challenge that needs to be tackled.

Conclusions and Recommendations

Digital innovation development

Digital innovation and digitalization have enormous potential for institutions, driving new ideas in business and industry, preparing learners for occupations where creativity is necessary, and helping to close the skills gap. While more needs to be done to make institutions systems more flexible and responsive to the changing needs of the labor market, there is increasing awareness and recognition that institutions have a much bigger role to play in both innovation and digitalization.

Digital innovation is a multifaceted concept that can be applied to various fields, including education and training. The word cloud above illustrates different aspects of innovation that can be explored further. However, when it comes to creating innovative learning environments, the OECD has identified seven principles that need to be incorporated. These principles include making learning central, promoting social and collaborative learning, focusing on learners' motivations and emotions, being sensitive to individual differences, challenging learners without overloading them, using assessments that provide formative feedback, and fostering horizontal connections across learning activities and subjects.

Putting these principles into practice requires three dimensions, which are innovation in the pedagogical core, becoming formative organizations with strong learning leadership, and opening up to partnerships with various stakeholders. It is also important to acknowledge that

innovation often involves micro-decisions made by teachers and trainers in classrooms and workplaces. Pedagogical innovations require teachers to be co-designers and adopt changes progressively and creatively, using their own experiences as anchors for implementation and innovation.

Despite the importance of innovation in education and training, many teachers and schools lack written plans or strategies regarding the use of digital technology. This highlights the need for more comprehensive support and guidance to help educators make informed decisions about incorporating technology into their teaching practices.

Digital innovation in education and training is vital for staying relevant and meeting the needs of learners in today's rapidly evolving world. By incorporating the principles and dimensions outlined by the OECD, educators can create innovative learning environments that support learners' needs and promote their success.

The implementation of innovation in teaching and learning can face challenges due to resistance from some teachers and trainers. This is especially true for technology-based innovations, where older cohorts of teachers and adult learners may be conservative. The difficulty in understanding what makes teaching effective further complicates the process of innovation. Teachers and trainers require the right support to fully understand the risks and benefits of innovation in order to embrace change. Despite the challenges, innovation in teaching and learning is necessary to keep pace with the rapidly changing technological landscape.

Vocational education and training can play a major role in the reskilling and upskilling of low and medium-tech occupations to prevent polarization of the labor market and an increase in

the digital divide. In addition, initial institutions is crucial to train the labor force in the skills of the future.

Technology can redefine and transform various aspects of teaching and learning. It can open up learning to new groups of people, redefine who educates, change the relationships between teachers and learners, and among learners, enable customization, and provide instant, real-time feedback to learners, and open up knowledge that was once inaccessible. Technology can also promote 21st century skills using media that are commonplace outside the place of learning. Learning can take place anywhere and anytime through mobile devices, which can reduce the costs of learning.

In conclusion, innovation in teaching and learning, especially in the form of digitalization, is necessary to keep pace with the rapidly changing technological landscape. However, the implementation of innovation can face resistance from some teachers and trainers, who require support to embrace change. A digital skills gap exists, which puts those with low digital skills at greater risk of unemployment, poverty, and social exclusion. institutions has a major role to play in the reskilling and upskilling of low and medium-tech occupations to prevent polarization of the labor market and an increase in the digital divide. Technology can redefine and transform various aspects of teaching and learning, which presents both opportunities and challenges.

Recommendations

The changing landscape of vocational education and training The world is currently undergoing rapid and unprecedented change, which has been amplified by the COVID-19 pandemic. The global economy is evolving quickly, with new ways of producing goods and

delivering services. Additionally, there is the looming threat of unpredictable climate change and environmental degradation, which have significant social implications. Digitalization is also transforming the vocational education and training profession, providing access to information like never before, but also presenting risks such as the proliferation of 'fake news'. These trends are only beginning to be understood in terms of their impact on social life, education, and democratic participation.

Digital innovation and digitalization are changing the nature of work, with the emergence of new types of employment and occupations, as well as environmental challenges. These developments are creating demand for new skills in the labor market, which necessitates both high-quality initial institutions and continuing institutions for upskilling and reskilling of the workforce. While there are shortages in some high-skill areas, basic skills deficiencies also exist. In the future, institutions at higher levels beyond traditional upper secondary education will be needed to address the need for medium and high skills. Key competences, such as those for 'green jobs', are becoming increasingly important in this changing world.

Vocational education and training have enormous potential for innovation and digitalization. Institutions are often seen as simply providing skills rather than having a more extensive role in the innovation ecosystem. However, there is increasing awareness and recognition that institutions have a much bigger role to play in both innovation and digitalization.

To fully unlock the potential of institutions for innovation and digitalization, a number of actions can be taken. Firstly, i Vocational education institutions should be recognized as having a much bigger role to play in innovation and digitalization. This can be achieved through raising awareness and recognition of institutions 's role in innovation and digitalization,

and by supporting institutions in their efforts to foster innovation and digitalization (Habib et al., 2023).

Secondly, Vocational education training should be made more flexible and adaptable to respond to the changing needs of the labor market. This can be achieved through the development of more agile vocational education training, with greater emphasis on the development of higher-level skills, and with greater integration of digital technologies in vocational education training.

Thirdly, Vocational education training should be developed as a key driver of competitiveness and environmental sustainability. This can be achieved through the development of smart specialization strategies, the promotion of green skills, and the development of competences that are critical to achieving the UN Sustainable Development Agenda.

In conclusion, vocational education training has enormous potential for innovation and digitalization, and there is a need for action to fully unlock this potential. By recognizing institutions 's role in innovation and digitalization, making institutions' systems more flexible and adaptable, and developing institutions as a key driver of competitiveness and environmental sustainability, we can ensure that institutions plays a critical role in shaping the future of work and society.

Limitations of this Study

One of the main limitations of the study is the lack of control over the quality of data sources used. Since the researcher did not collect the data themselves, they have no control over the accuracy, validity, and reliability of the sources. This raises concerns about the credibility of the data and the conclusions drawn from them. Desk research is subjective and prone to

researcher bias, as the researcher's interpretation of the data may be influenced by their pre-existing beliefs or values. Furthermore, the study's reliance on secondary data may limit its scope and depth. Desk research may not provide a comprehensive understanding of the research problem since the data collected may not cover all aspects of the issue. The study may have overlooked critical information that could affect the research conclusions. This could affect the generalizability of the study's findings, and the implications of the research may not be applicable to other contexts.

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Semantic segmentation algorithm based on fused ASPP full convolutional discriminator for generative adversarial networks

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Abstract

Currently, commonly used semantic segmentation networks, such as Deeplab_v2, FCN, Dilation10, etc., suffer from deep network structure, long training time and insufficient segmentation accuracy. To address the above problems, this paper proposes a semantic segmentation algorithm incorporating Atrous spatial pyramid pooling(ASPP) full convolutional discriminator for generative adversarial networks . The semantic segmentation network uses the baseline of Deeplab_v2 as a generator to generate the probability map of the segmentation result, and a full convolution discriminator of fusing ASPP is designed. The generator and discriminator are used to form a generative adversarial network for semantic segmentation, which enables the segmentation network to optimize the local features of the segmentation network with the discriminator without increasing the depth of the network, thus improving the segmentation accuracy of the segmentation network. Experimental results on the PASCAL VOC 2012 dataset demonstrate the effectiveness of the algorithm, with a 7.3% improvement in segmentation accuracy compared to FCN and a 3.7% improvement in segmentation accuracy compared to Deeplab_v2's baseline.

1. Introduction

Image semantic segmentation is an important part of computer vision technology regarding image understanding, which has been successfully applied in autonomous driving, medical image processing, and multispectral satellite image segmentation. In image semantic

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segmentation, the Fully Convolutional Network (FCN) proposed by Long et al [1] at CVPR 2015 is able to obtain target classification results for each pixel by end-to-end learning, and unlike the constructs used for image recognition and classification, the FCN replaces the 1 x 1 convolutional layer with the The proposed FCN is a major breakthrough for semantic segmentation and also achieves good segmentation results, but the lack of constraints on image space and edge information leads to coarse final image segmentation results. To address this problem, Chen et al [2] proposed DeepLab, which accurately adjusts the resolution by using null convolution instead of the original upsampling, so that a point on the feature map corresponds to a region on the input map, i.e., a larger sensory field; meanwhile, using spatial pyramidal pooling, so that the input image can have an arbitrary scale without affecting the input size of the fully connected layer in the neural network; finally, using The Deeplab framework improves the problem of FCN segmentation accuracy but has the problems of deep network structure and long training time. Meanwhile, researchers have made many improvements to the CNN-based semantic segmentation algorithm. Generative adversarial networks (GANs) were proposed by Ian Goodfellow et al [5] in 2014. the idea of GAN is to play a very large and very small game between generators and discriminators. the goal of generative networks during the training process of GAN is to try to generate real pictures to deceive The goal of the discriminative network is to try to separate the images generated by the generative network from the real ones. In this way, the generative network and the discriminative network form a dynamic "game process", through which the generative network generates samples with similar distribution to the target. GANs have attracted much attention since their introduction and have been improved [7, 13,14,17] and widely used, including image generation [4, 6], super-resolution techniques [8, 9], and semantic segmentation [19, 23]. in 2016, Pauline Luc et al [23] applied generative adversarial networks to image segmentation for the first time, which provided GANs to provide new ideas in image segmentation.In 2017, Nasim Souly et al [11] treated the segmentation network FCN as a discriminator and used the generator of GAN to extend the training data, thus improving the training effect.In 2018, Wei-Chih Hung et al [12] used the segmentation network as a

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generator and designed a fully convolutional discriminator for the optimization of segmentation networks and applied it to semi-supervised learning. The aforementioned study used GANs for semantic segmentation, which is only a simple combination of GANs and segmentation networks, and has some improvement on segmentation results, but the effect is not very obvious.The idea of GANs is helpful for improving the accuracy of CNN-based classification and segmentation tasks, and there are still questions about how and where the discriminant network is optimized for segmentation networks. In this paper, drawing on the idea of GANs, an adversarial learning scheme is also used, using a fully convolutional discriminator, using this discriminator to learn to distinguish the probability map of the real data from the probability map of the segmentation result of the segmentation network . This discriminator is combined with the segmentation network to form a generative adversarial network, thus achieving the goal of improving the segmentation accuracy of the segmentation network without increasing the depth of the segmentation network. In order to further optimize the semantic segmentation effect of GAN-based convolutional neural network, we design a new discriminator incorporating Atrous spatial pyramid pooling (ASPP), which can obtain a larger range of contextual information and thus improve the segmentation accuracy of the segmentation network.

The contribution of this work is summarized as follows:

1. We improve the accuracy of segmentation network segmentation by using the scheme of generative adversarial networks (GANs) and adding a discriminative network in this paper to optimize the segmentation network without increasing the depth of the segmentation network. And based on this idea, we can also apply it to other segmentation networks (e.g., FCN, U-Net [15], etc.).

2. In this paper, we use a full convolutional network containing Atrous spatial pyramid pooling (ASPP) in a discriminative network, the idea of which is to provide models with multi-scale information that can be used to capture a large range of contexts. Through this discriminative network, generative adversarial learning is continuously performed with the segmentation network as a way to optimize the segmentation network.

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2. The semantic segmentation network structure and loss function designed

The proposed FCN is a major breakthrough for semantic segmentation, and also achieves good segmentation results, but the lack of constraints on image space and edge information leads to a coarse final image segmentation result. Deeplab_v2 network, on the other hand, uses a fully connected conditional random field (CRF) to improve the segmentation accuracy of Deeplab_v2 network by performing bilateral filtering operations on the probability of the original image size and capturing a larger range of contextual information. Deeplab_v2 network network structure is getting deeper and deeper, and the computational resources required are too large, which is not conducive to learners for learning and implementation. To address these problems, this paper designs a semantic segmentation network for generative adversarial networks containing Atrous spatial pyramid pooling (ASPP) with a full convolutional discriminator.

In this paper, a new semantic segmentation network is composed by borrowing the idea of generative adversarial network, so that the segmentation network can improve the segmentation accuracy of the segmentation network without increasing the network depth. In particular, the baseline of the semantic segmentation network Deeplab_v2 is used as a generator for generating probability maps of segmentation results, but the conditional random field (CRF) in Deeplab_v2 is not used here to obtain a larger range of contextual information to improve the accuracy of the segmentation boundary, because it would increase the segmentation network depth. In order not to increase the network depth of the segmentation network, this paper designs a full convolutional discriminator containing ASPP, which borrows the network structure of semantic segmentation (FCN) of full convolutional network, and thus forms a generative adversarial network with the segmentation network for improving the segmentation accuracy of the generator, i.e., the segmentation network. And since the improvement of segmentation accuracy in this generative adversarial process mainly

relies on the discriminator's discrimination of the probability map of the natural image or the probability map generated by the segmentation network to optimize the score, in order to further improve the segmentation accuracy of the segmentation network, the final pooling layer of the discriminative network is replaced with ASPP in this paper, whose role is to sample the given input with a null convolution of different sampling rates, which is equivalent to capturing the image context at multiple The discriminator is able to improve the discriminative power of this discriminator by better differentiating between the probability map of natural images and the probability map generated by the segmentation network. By using this generator and the discriminator containing ASPP to form a generative adversarial network for semantic segmentation, the segmentation network can optimize the local features of the segmentation network with the discriminator without increasing the network depth, thus improving the segmentation accuracy of the segmentation network. Experimental results on the PASCAL VOC 2012 dataset [3] demonstrate the effectiveness of the algorithm, with a 7.3% improvement in segmentation accuracy compared to FCN and a 3.7% improvement in segmentation accuracy compared to Deeplab_v2's baseline.

2.1. Network Structure

In this paper, we design a general semantic segmentation network incorporating ASPP full convolutional discriminators by borrowing the ideas of generative adversarial networks, and the general network structure is shown in Figure 1. The whole network structure consists of two modules: semantic segmentation network and discriminator network.
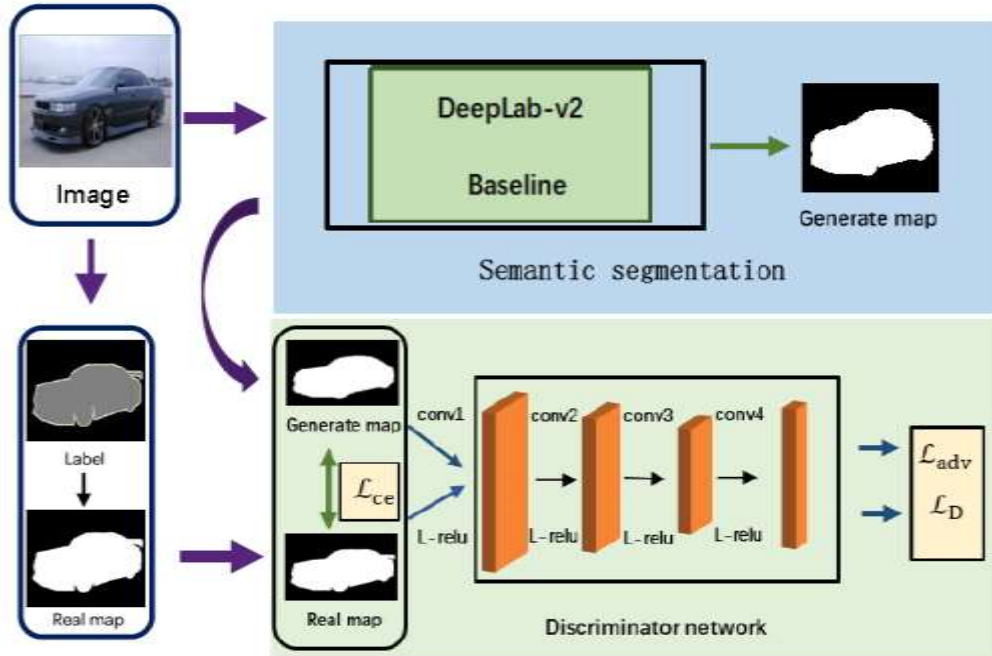
Figure 1. Semantic segmentation network structure of generative adversarial network based on fused ASPP full convolutional discriminator

In this paper, the semantic segmentation network is used as the generative network by borrowing the idea of generative adversarial network, where the semantic segmentation network can be any segmentation network, such as: FCN, U-Net and Deeplab_v2. In this paper, Deeplab_v2 baseline is chosen as the segmentation network for training. And a discriminative network with ASPP is designed to make the segmentation network perform adversarial learning by using the idea of generative adversarial learning. continuously optimizes the segmentation network parameters , i.e., the local features of the segmentation network are optimized by using the discriminative network, so as to achieve the purpose of optimizing the segmentation results. In this way, the segmentation accuracy can be improved without increasing the network depth of the segmentation network, and it is not necessary to improve the segmentation accuracy by adding various post-processing methods like other

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segmentation networks. Since the segmentation network and the discriminative network are independent of each other, there is no increase in the depth of the segmentation network. Also, we use migration learning for the segmentation network, which enables it to get better segmentation results in a shorter time.

Specifically, by using the DeepLab_v2 framework with the ResNet-101 [10] network (shown in Figure 1) to form a segmentation network framework, a model trained based on the MS COCO dataset [20] was used as a pre-trained model. Instead of using the conditional random field proposed in DeepLab_v2 to optimize the segmentation results, this paper removes the last classification layer and modifies the step size of the last two convolutional layers from 2 to 1, so that the resolution of the output feature mapping effectively reaches 1/8 of the input image size; finally, an upsampling layer and Softmax output are used to match the size of the input image, i.e. Implementing an image of size H x W x 3 given to the segmentation network enables the output of a probability map of size H x W x C, where C is the number of semantic segmentation categories.
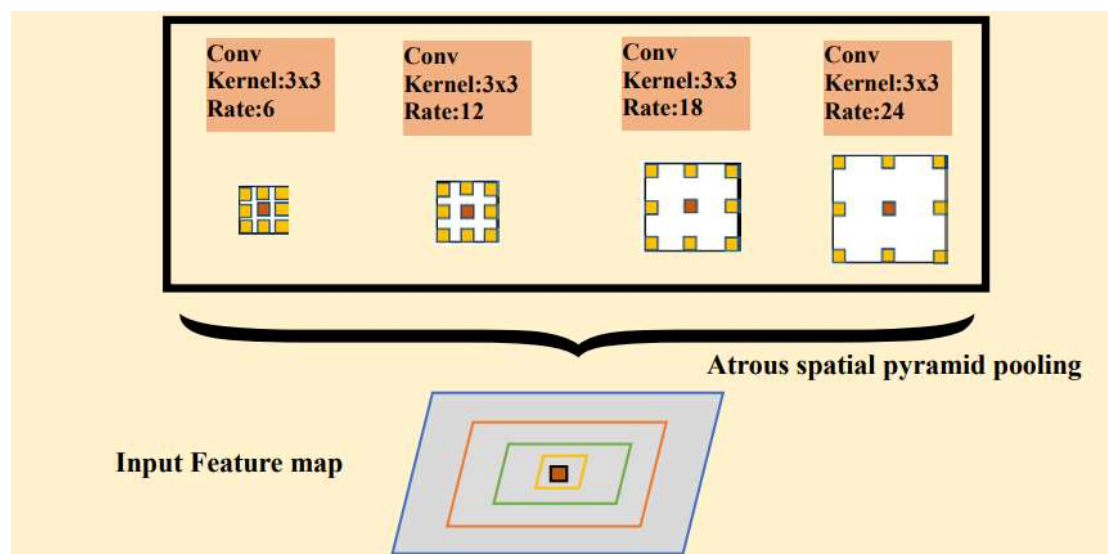
Figure 2. Atrous spatial pyramid pooling (ASPP) Network structure

In the deeplab_v2 network framework, the null convolution and Atrous spatial pyramid pooling are introduced to expand the perceptual field and thus improve the segmentation accuracy of the segmentation network. The results are concatenated together, and finally the

number of channels is reduced to the desired value by a 1x1 convolutional layer. In this paper, a 3x3 convolution filter is used, and the rates are set to {6, 12, 18, 24}. By setting different rates, a larger range of contextual information can be added without increasing the number of parameters or computational effort. In addition, based on ASPP, global average pooling (GAP) is implemented to fuse the image level features and thus increase the global contextual information.
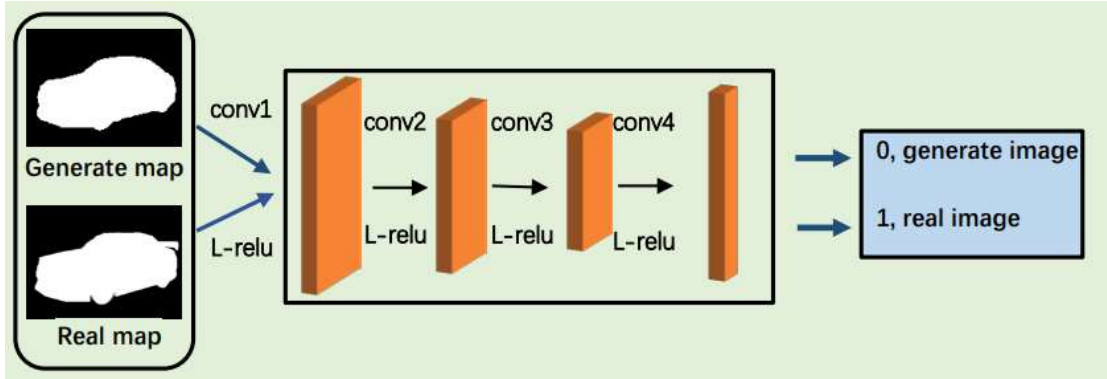

Figure 3. Network structure of Discriminator network

The discriminative network in the segmentation network designed in this paper is shown in Fig. 3. The discriminative network is based on FCN, while incorporating ASPP in the network to expand the contextual information and increase the global contextual information by ASPP, so that the discriminative network can perform better discrimination. The discriminative network consists of five convolutional layers with 4 × 4 kernels and one APSS, and the number of channels corresponding to the convolutional layers is {64, 128, 256, 512,1024, 1} with a step size of 2. Except for the last layer and the APSS, each convolutional layer is followed by a Leaky-ReLU [22] layer with parameter 0.2. The expression of Leaky-ReLU is:

$$y_i = \begin{cases} x_i & if \ x_i \geq 0 \\ \dfrac{x_i}{\alpha_i} & if \ x_i < 0 \end{cases} \tag{1}$$

where α_i is a fixed parameter in the interval (1, + ∞). An upsampling layer is added to the

last layer to scale the output to the size of the input mapping, thus forming a fully convolved discriminator network, which allows the input image to be of arbitrary size. Specifically, the discriminator network takes as input the segmentation probability map or the real data probability map generated by the segmentation network and outputs a spatial probability map of size H x W x 1. The discriminator outputs each pixel p of the mapping when p=1, indicating that the pixel is from the real data label, and when p=0, indicating that the pixel is from the segmentation network.

In the training process, migration learning was applied to freeze block1, block2, block3, block4 and block5 and their preceding layers, respectively, and train only the layers behind them. By selectively freezing certain layers, the corresponding training results are obtained, so that the effect of different layers on the segmentation results can be explored, and the training time can be greatly reduced.

2.2. Generating adversarial networks

The optimization of generating an adversarial network is a minimal maximal game problem. In this minimal-maximal game process, it is necessary to prove that an optimal discriminator can be obtained. Given a generator G, maximizing V(D,G) yields the optimal discriminator D. Where maximizing V(D,G) evaluates the difference or distance between p_G and p_{data}. The value function can be written as an integral over x, i.e., the mathematical expectation is expanded into integral form as follows:

$$\int_x p_{data}(x)\log D(x) + \int_z p(z)\log(1-D(G(z)))dz$$
$$= \int_x p_{data}(x)\log D(x) + p_G(x)\log(1-D(x))dx \quad (2)$$

With the data given and G given, both $p_{data}(x)$ and $p_G(x)$ can be considered as constants, denoted by a and b, so that the quilt function can be expressed as:

$$f(D) = a\log(D) + b\log(1-D) \quad (3)$$

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Derivation of (3) yields:

$$\frac{df(D)}{dD} = a \times \frac{1}{D} + b \times \frac{1}{1-D} \times (-1) = 0 \qquad (4)$$

Solving for (4) yields:

$$D^* = \frac{a}{a+b} \qquad (5)$$

Substituting $p_{data}(x)$ and $p_G(x)$ into (5), we get:

$$D_G^*(x) = \frac{p_{data}(x)}{p_{data}(x) + p_G(x)} \qquad (6)$$

where $D_G^*(x)$ is the optimal solution. This optimal D is not computable in practice, but is very important mathematically. We do not know the a priori $p_{data}(x)$, so it will never be used in training. On the other hand, its existence allows us to prove that the optimal G exists, and only D needs to be approximated in training.

The goal of generating the adversarial network training is such that $= p_G \ p_{data}$, which minimizes the value function of G at this point. Because the JS scatter (Jensen-Shannon) of the two distributions of p_G and p_{data} is 0 at this time. Substituting $= p_G \ p_{data}$ into the expression of (6):

$$D_G^*(x) = \frac{p_{data}(x)}{p_{data}(x) + p_G(x)} = \frac{1}{2} \qquad (7)$$

As seen above, the discriminator has been completely confused, and it cannot distinguish the difference between p_{data} and p_G at all, i.e., the probability of judging that the samples come from both p_{data} and p_G is $\frac{1}{2}$. Based on this idea, the GAN authors prove that G is the solution of the minimal-extreme game. That is, the training criterion C(G)=max V(G,D) can

reach the global optimum when and only when $= p_G \ p_{data}$. Therefore, for generative adversarial networks, the function V(D,G) can be defined as follows：

$$V(D,G) = E_{x \sim p_{data}(x)}\big[\log D(x)\big] + E_{z \sim p_z(z)}\big[\log(1 - D(G(z)))\big] \quad (8)$$

Where, x denotes the real picture, z denotes the noise input to the G network, and G(z) denotes the picture generated by the G network. d(x) denotes the probability of the D network to judge whether the real picture is real or not. And D(G(z)) is the probability of the D network to judge whether the G-generated picture is real or not.

The optimal generative model can be found by the following equation：

$$G^* = \arg \min_G \max_D V(D,G) \quad (9)$$

As a result, the objective function defined by GAN is as follows：

$$\min_G \max_D V(D,G) = E_{x \sim p_{data}(x)}\big[\log D(x)\big] + E_{z \sim p_z(z)}\big[\log(1 - D(G(z)))\big] \quad (10)$$

This is a maximum-minimum optimization problem that first optimizes D and then G. Essentially, it is two optimization problems that are disassembled to obtain the following two formulas:

Optimization of discriminatory networks：

$$\max_D V(D,G) = E_{x \sim p_{data}(x)}\big[\log D(x)\big] + E_{z \sim p_z(z)}\big[\log(1 - D(G(z)))\big] \quad (11)$$

Optimization of generation networks：

$$\min_G V(D,G) = E_{z \sim p_z(z)}\big[\log(1 - D(G(z)))\big] \quad (12)$$

When optimizing the discriminative network, independent of the generative network, the latter G(z) corresponds to the false samples already obtained. The first term of the formula of D is optimized so that the larger the result obtained when the true sample x is input, the better, because the prediction result of the true sample needs to be as close to 1 as possible. For the false sample, the result needs to be optimized so that the smaller the result the better,

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that is, the smaller D(G(z)) the better, that is, the larger 1-D(G(z)) the better.

The optimization generates the network independent of the true samples, so the first term is removed directly, when the label of the false sample is desired to be 1, so the larger D(G(z)) is the better, i.e., the smaller 1-D(G(z) is the better.

These two optimization models are combined to form the maximum-minimum objective function in (10), which contains both the optimization of the discriminative model and the optimization of the generative model with falsity.

2.3. Loss function of the network in this paper

The semantic segmentation network designed in this paper is implemented by borrowing ideas from generative adversarial networks. For the generative network in GAN, we replace it with a segmentation network, and then design a fully convolutional discriminator network to optimize the segmentation network. The full convolution discriminator network is trained using $\mathcal{L}_{\mathbf{D}}$ loss. Two loss functions are used in the segmentation network: a spatial multiclass cross-entropy loss $\mathcal{L}_{\mathbf{ce}}$ for segmenting real data, and an adversarial loss $\mathcal{L}_{\mathbf{adv}}$ for confusing discriminators.

Given an input image X of size H x W x 3_n , denote the segmentation network by $S(\bullet)$ and the prediction probability map of size H x W x C by S($\mathbf{X_n}$) denotes the predicted probability map of size H x W x C, where C is the number of categories. A full convolution discriminator is denoted by $D(\bullet)$ which uses a probability map of input size H x W x C, where the discriminative network has two possible inputs:the segmentation prediction S(X)$_n$ or the real data vector Y$_n$. The predicted probability map of output size H x W x 1 is used to discriminate whether the input probability map is from the segmentation network or the real data.

Discriminant network: in order to train the discriminant network, the loss of spatial cross-entropy of the two classes $\mathcal{L}_{\mathbf{D}}$ Minimize :

$$\mathcal{L}_{\mathrm{D}} = -\sum_{h,w}(1-\mathrm{y}_{\mathrm{n}})\log(1-D(S(X_n))^{(h,w)}) + y_n\log(D(Y_n)^{(h,w)}), \qquad (13)$$

where $y_n = 0$ if the sample is from a segmentation network and $y_n = 1$ if the sample is from a real data label. In addition, $D(S(X_n))^{(h,w)}$ is the confidence map of X at position (h, w) and $D(Y_n)^{(h,w)}$ is defined similarly. To convert the real data label mapping with discrete labels into a C-channel probability mapping, a One-Hot Encoding is used on the real data label mapping, and the value of $Y_n^{(h,w,c)}$ is 1 if the pixel $X_n^{(h,w)}$ belongs to class C and 0 otherwise.

Segmentation **networks:** training segmentation networks by minimizing a multi-task loss function:

$$\mathcal{L}_{\mathbf{seg}} = \mathcal{L}_{\mathbf{ce}} + \lambda_{\mathbf{adv}}\mathcal{L}_{\mathbf{adv}} \qquad (14)$$

Among them $\mathcal{L}_{\mathbf{ce}}$, and $\mathcal{L}_{\mathbf{adv}}$ denote spatial multiclass cross-entropy loss, and adversarial loss, respectively. $\lambda_{\mathbf{adv}}$ are the weights of the adversarial loss function.

Given an input image with its true data at Y_n and a predicted outcome at $S(X_n)$, the cross-entropy loss is obtained as:

$$\mathcal{L}_{\mathbf{ce}} = -\sum_{h,w}\sum_{c\in C}Y_n^{(h,w,c)}\log(S(X_n)^{(h,w,c)}), \qquad (15)$$

Through the loss $\mathcal{L}_{\mathbf{adv}}$ of an adversarial learning process to give a fully convolutional discriminative network $D(\bullet)$:

$$\mathcal{L}_{\mathbf{adv}} = -\sum_{h,w}\log(D(S(X_n))^{(h,w)}). \qquad (16)$$

This loss is used to train the segmentation network to maximize the probability of the predicted outcome generated in the segmentation network for the purpose of deceiving the discriminator.

3. Experiment

3.1. Experimental equipment and parameter settings

The designed semantic segmentation network is implemented using the Pytroch framework. The model was trained on a GTX 1070Ti GPU with 8GB of RAM . To train the designed semantic segmentation network, stochastic gradient descent (SGD) optimization method is used. Where the momentum is 0.9 and the weight decay is 10^{-4} . the initial learning rate is set to 2.5×10^{-4} and the decay is polynomial decay with power 0.9. Also, migration learning is used for the segmentation network. Block1, block2, block3, block4, and block5, and their preceding layers, respectively, were frozen, and only their following layers were trained. To train the discriminator, the Adam optimizer [18] was used, with a learning rate of 10^{-4} , the same polynomial decay as for the segmentation network, and λ_{adv} set to 0.007. The specific parameters were designed as in Table 1.

Table 1. Training parameter settings

Parameter	PASCAL VOC2012
Trained iterations	20,000
Learning rate	2.5e-4
Learning rate (D)	1e-4
Polynomial decay	0.9
Momentum	0.9
Optimizer	SGD
Optimizer (D)	Adam
Batch size	6
Weight decay	0.0001
Crop size	321x321

3.2. Evaluation indicators

For this paper, experiments were conducted using the PASCAL VOC 2012 semantic segmentation dataset. On this dataset, the mean value of mean Intersection over Union (mean IU), which is the sum of different category recognition accuracies, is used as an evaluation metric. The expressions are as follows:

$$mean \quad IU = \frac{1}{n_{cl}} \sum_i \frac{n_{ii}}{\sum_j n_{ij} + \sum_j n_{ji} - n_{ii}} \qquad (17)$$

where n_{cl} is the total number of categories (including background), n_{ij} is the number of pixels that would have belonged to category i but were predicted to be in category j, and n_{ii} is the number of pixels that were correctly predicted.

3.3 Experimental results

For the semantic segmentation network structure in this paper, the segmentation network is optimized using a discriminator containing ASPP, and Figure 4 shows the change of mean IU with the increase of training times when the network is trained. From Fig. 4, it can be seen that mean IU increases with the increase of training times, and the value of mean IU increases rapidly from 0 to 10,000 training times; while from 10,000 to 20,000 training times, the value of mean IU increases more slowly. This is because the pre-training model is used during training, and the parameters trained on the COCO dataset are assigned to this network, so that the mean IU is not raised from 0 during the training process, which greatly reduces the time spent on training and gets better segmentation results in a shorter time, and this The segmentation accuracy of the segmentation network is also improved to a certain extent.
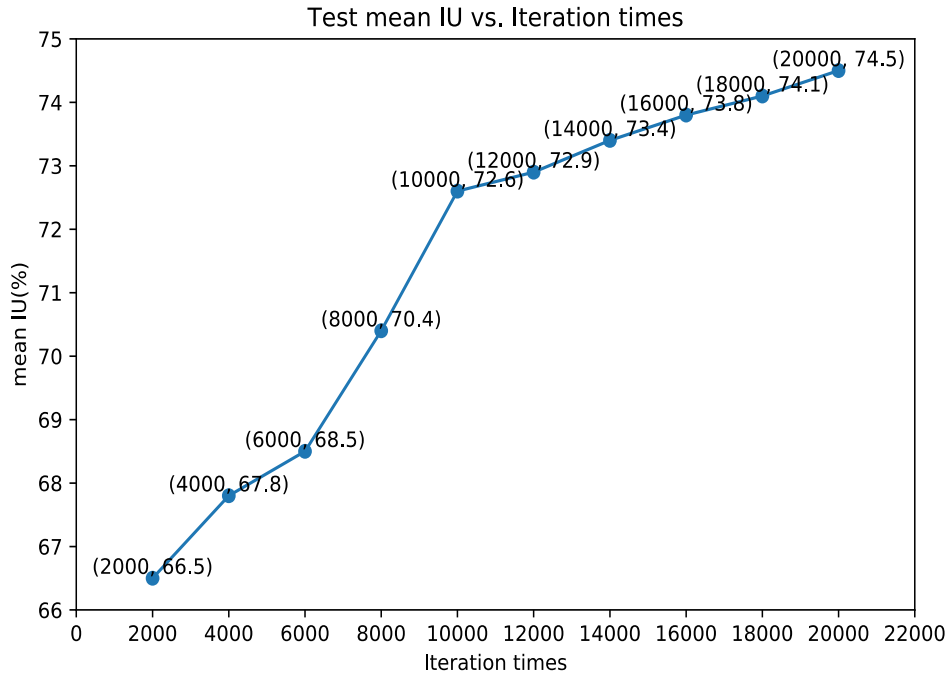
Figure 4. Plot of training times versus mean IU obtained using generative adversarial and migration learning

In order to verify the effectiveness of the method in this paper, the segmentation experiments are performed on the same dataset using the segmentation method in this paper and other methods, as shown in Figure 8. In Fig. 8, the segmentation results of manually labeled segmentation graph, baseline, with the addition of generative adversarial network, and with the addition of migration learning are listed. From the results, it can be seen that there is a great improvement in the segmentation accuracy for the segmentation network with the addition of generative adversarial network and migration learning. The segmentation boundary is significantly improved compared to baseline.

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| image | annotation | baseline | $+\mathcal{L}_{adv}$ | $+\mathcal{L}_{adv}$(APSS) |
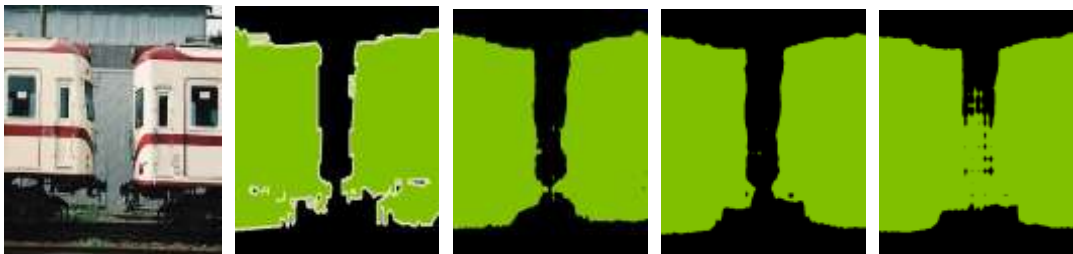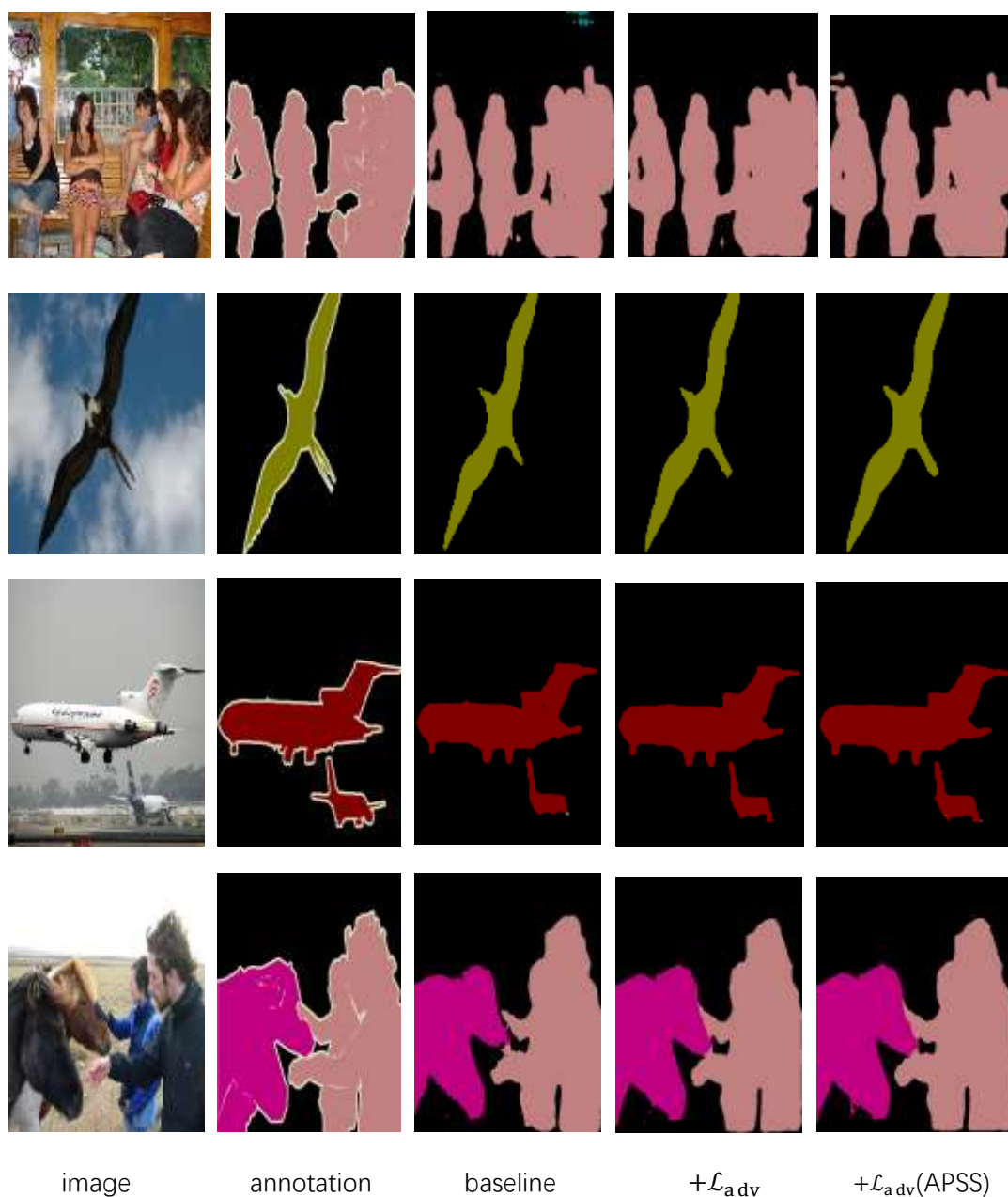
Figure 8: Comparison of the Pascal VOC 2012 dataset with different methods, where the first column is the natural image, the second column is the segmented image with manual annotation of the natural image, the third column is the segmented image obtained by training the baseline network of deeplab_v2, the fourth column is the segmented image obtained after using a discriminator, and the fifth column is the segmented image obtained after using a discriminator containing APSS discriminator.

4. Experimental analysis

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The PASCAL VOC 2012 dataset contains 20 common objects, 1 background, and annotations on each image. In addition, a total set of 10,582 images from the training set and 1,449 images from the validation set were obtained using images from the segmentation boundary dataset (SBD) [21] to evaluate our semantic segmentation network model on the validation set. A random scaling and cropping operation of size 321 × 321 was used during the training process. Each model was trained on the PASCAL VOC dataset with 20k iterations and a batch size of 6.

Experiments were conducted on the PASCAL VOC 2012 dataset , and the mean IU of FCN was 67.2%, the mean IU of Dilation10 was 73.9%, and the mean IU of baseline was 70.8%. Here the baseline is the DeepLab-v2 model without multi-scale fusion, and the performance of baseline is compared with FCN, the mean IU of Dilation10 is compared, and it can be found that the performance of the baseline model used in this paper is comparable to that of the state-of-the-art scheme. With the training of PASCAL VOC 2012 dataset, the mean IU after using the discriminator in this paper is 74.5%, which is a 3.7% performance improvement compared to 70.8% of baseline.

From this, it can be seen that with the introduction of the generative adversarial idea, the effect of using a discriminator to optimize the segmentation network is remarkable, while not increasing the depth of the segmentation network, which can save the computer's computational resources. In addition, the discriminator can be combined with other segmentation networks (FCN, U-Net, etc.), which can also serve the purpose of improving the segmentation accuracy of the segmentation network.

Table 2. Results derived from the PASCAL VOC 2012 validation set

Method	Result
FCN-8s [2]	67.2
Dilation10 [16]	73.9

DeepLab-v2 baseline	70.8
Baseline + $\mathcal{L}_{adv}$	74.5

The comparison of the mean IU obtained by the discriminator with and without APSS for the segmentation network is presented in Table 3. We used the Pascal VOC 2012 dataset with 20 classes and 1 background. From the above results, we can see that when using APSS, although the accuracy of some class segmentation decreases, it only decreases a little bit and the magnitude is small. For such as chair, dining table, potted plant, etc. , the segmentation accuracy is very poor when APSS is not used, with IU of 0.34, 0.55, and 0.60, respectively, which are much smaller than the mean IU. When APSS is used, the IU of these classes are 0.37, 0.59, and 0.65, respectively, with different degrees (1% to 5%) of improvement. From the experimental results, it can be seen that the use of ASPP has a significant improvement on the originally poor classes of the segmentation network, and a good discriminator is essential for the performance improvement of the segmentation network.

The literature [23] also uses the idea of generative adversarial networks to optimize the segmentation network with a discriminator and is a representative algorithm in using generative adversarial networks for semantic segmentation. Comparing the semantic segmentation network designed in this paper with the segmentation network in [23], firstly, we design a generic discriminator that can be used for various segmentation networks, while [23] uses one network structure for each dataset, and in comparison the segmentation network we design is more generic. Secondly, the discriminator of the segmentation network in this paper does not require RGB images as additional inputs, but operates directly on the prediction maps from the segmentation network. Also, the semantic segmentation network designed in this paper introduces migration learning, which makes the training time reduced by using a pre-trained model to obtain segmentation results in a shorter time and also improves the network performance.

The specific comparison results are shown in Table 3. The mean IU of the baseline of the

literature [23] is 71.8%, and the mean IU after using the discriminator is 72.0%, which is only 0.2% higher than the mean IU of the baseline of [23], while the baseline of this paper is 70.8%, and the mean IU after using the discriminator designed in this paper is 74.5%, which is a 3.7% improvement compared to the baseline of this network, and the mean IU of this paper is 2.5% higher than that of [23] after using the discriminator of [23]. The experimental results show that the semantic segmentation network designed in this paper has a large improvement for [23].

Table 3. Comparison with [23] using PASCAL VOC 2012

	Baseline	Adversarial
[23]	71.8	72.0
Ours	70.8	74.5

The weights of the adversarial loss λ_{adv} are taken to different values to the corresponding segmentation results to find the optimal mean IU and thus the optimal λ_{adv}. It can be seen from Table 4 that when λ_{adv} is 0.007, the obtained mean IU is 74.5% and the optimal segmentation result is obtained. When λ_{adv} is 0 the mean IU is 70.8%, which is 3.7% different from the optimal one. When is λ_{adv} 0.03, the mean IU is 60.7%, and the segmentation result is poor, which also shows that the value of λ_{adv} is not as large as the best. It can also be found from Table 5 that when λ_{adv} is less than 0.007, as the value of λ_{adv} increases, the segmentation result becomes better and better. When the value of λ_{adv} is greater than 0.007, the segmentation result will be worse as the value of increases with λ_{adv}.

Table 4: Comparison of different values taken for λ_{adv}

λ_{adv}	Result
0	70. 8
0. 001	72. 6
0. 003	74. 0
0. 005	74. 0
0. 007	74. 5
0. 01	74. 3
0. 02	71. 2

5. Conclusion

In this paper, a semantic segmentation algorithm based on a generative adversarial network containing an ASPP fully convolutional discriminator is proposed. The proposed method uses a scheme of generative adversarial networks (GANs), consisting of a segmentation network and a discriminator, which is generic. In this paper, Deeplab_v2 is used as the segmentation network, but we do not use post-processing methods such as conditional random fields (CRF) used in it to improve the segmentation accuracy, which makes the segmentation network used in this paper relatively shallow. The discriminator uses a full convolutional network with Atrous spatial pyramid pooling (ASPP) to distinguish between the input map, which is a probability map of the real data, and the probability map of the segmentation result of the segmentation network. Through this discriminator and the segmentation network to generate adversarial, the discriminator continuously optimizes the model parameters of the segmentation network, so as to improve the segmentation accuracy of the segmentation network. And in this adversarial learning process, the network depth of the segmentation network does not increase. Meanwhile, we use migration learning in the segmentation network with a pre-trained model trained on the COCO dataset for the training in this thesis, to achieve the purpose of reducing the training time and saving computer

resources. And we explore the impact of the discriminator used in this paper on the segmentation network by freezing different layers separately. And through migration learning, we can reduce the GPU requirement and also get a better segmentation result. Extensive experiments are conducted on the PASCAL VOC 2012 dataset to verify the effectiveness of the algorithm.

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Teaching Strategies for Cultivating Computer Ability of Future Professionals in Higher Vocational Colleges in the Post-epidemic Era

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Abstract

This research examined the teaching methods professors at higher vocational colleges used to develop their students' computer abilities after the pandemic. Data on professors' methods of instruction, challenges, and the pandemic's consequences on computer education were gathered using qualitative research techniques, including questionnaires and interviews. The findings showed that instructors use a variety of strategies, including interactive exercises and simulations, online learning environments, and technology-enhanced assessment, to assist students in developing their computer skills. However, educators also talked about their challenges in the post-epidemic period, such as modifying their teaching methods to accommodate online learning and motivating and engaging their students in the learning process. In the post-epidemic era, the findings may be used to build effective teaching strategies for fostering computer proficiency in future professionals in higher vocational institutions.

Keywords

Post-Epidemic, Teaching Methodologies, Computer Technology, Higher Vocational Institutions, Technology-Enabled Strategies.

Introduction

The world has changed due to the quick advancement of computer technology, which has also helped individuals solve challenges. Any career requires a certain amount of computer proficiency to become a professional. The need to develop computer skills for future professionals at higher vocational institutions has grown more urgent and significant with the advent of the post-epidemic period. Therefore, providing efficient training methods for fostering future professionals' computer skills at higher vocational institutions is crucial.

Computer technology has advanced quickly in the last ten years. It is now a necessary tool for most people in their everyday lives and at work, and it is extensively utilized across various sectors. As a result, computer technology has taken on increasing importance in modern life, and if people are to succeed, they must possess a certain level of computer proficiency. Higher vocational institutions have also become popular as a preferred option for many students (Deng, 2021). These institutions provide more practical education and specialized courses that can help students get ready for the workforce. However, many universities don't have efficient teaching methods for developing future professionals' computer skills. If such tactics aren't taught, students could not be properly equipped for their current job, where computer technology is crucial.

The need to develop computer skills for future professionals at higher vocational institutions has grown more urgent and significant in the post-epidemic period. As the world transitions to a digital economy, proficiency in computer technology is now required in practically every career. Students have difficulty striking out in the job market without a solid grasp of computer technology (Deng, 2021). Therefore, providing efficient training methods for fostering future professionals' computer skills at higher vocational institutions is crucial.

In higher vocational institutions in the post-epidemic age, this study aims to investigate effective teaching methods for developing computer skills in future professionals. This study will assess the existing environment in higher vocational institutions and suggest particular training methodologies to develop the computer skills of aspiring professionals.

For several reasons, it isn't easy to establish efficient teaching methods for fostering computer proficiency in future professionals in higher vocational institutions in the post-epidemic period. First, because computer technology is developing quickly, the course material must be updated often to reflect the newest developments (Deng, 2021). Second, giving students the help, they need is challenging since higher vocational institutions lack the necessary resources. Third, creating appropriate courses for all students might be challenging, given their varied backgrounds and learning preferences. Finally, it is challenging to guarantee the quality of instruction due to the shortage of trained professors at higher vocational colleges. These difficulties must be overcome to create successful teaching methods for fostering computer proficiency in future professionals at higher vocational institutions in the post-epidemic age.

Literature Review

Digital technology's significance in the modern workplace has grown considerably since the end of the pandemic. Therefore, teachers at more advanced vocational institutions must focus on developing their students' computing skills to meet the demands of the future workforce. Guo (2021) purports that teachers need to use new methods of instruction to give their kids a fighting chance in today's technology-driven labor market. Since the end of the pandemic, digital technology's role in the workplace has grown in significance. Common examples of computer use in the workplace include data entry, analysis, and reporting (Guo, 2021). Therefore, instructors at more advanced vocational institutions must foster students' computer abilities to

prepare graduates to take on such responsibilities fully. Teachers need to use efficient instructional methods to foster students' computer skills. Several studies have focused on educators' practices in developing their pupils' computing skills. For instance, Ding et al. (2018) examined how hands-on projects might help students develop their IT-related problem-solving abilities. Practical projects effectively involved students in problem-solving activities and equipped them with marketable abilities.

Similarly, Hu et al. (2019) examined how flipping the classroom may help students develop their computing skills. The research concluded that using flipped classrooms to teach computer skills to pupils would be beneficial. The study also indicated that using flipped classrooms may help students hone their critical thinking abilities, which will serve them well in any field.

Other studies have looked at how VR and AR may be utilized to help students learn to code. For instance, Huang et al. (2020) looked at how virtual reality and augmented reality may be used to teach students how to utilize computers more effectively. This research shows that students can benefit from using these technologies to participate in interactive and immersive learning environments that teach them to utilize computers more effectively. The survey also discovered that students could benefit from using these tools to hone problem-solving and critical-thinking abilities that will serve them well in their future careers.

Teachers at more advanced vocational institutions should embrace a constructivist theoretical stance to best foster students' computer skills. Active learning and constructing one's own body of knowledge are given centrality in the constructivist philosophy of education. Constructivism holds that learning is a dynamic process in which knowledge is built by the student's engagement with their surroundings (Ma, 2022). Teachers at vocational universities

might use constructivism as a theoretical basis for developing their students' computational skills. This is because constructivism places a premium on student participation, pivotal in acquiring computational competence. For instance, constructivism promotes practical and problem-solving exercises in the classroom, which may help students acquire valuable skills for their chosen careers.

Many studies have been done on how best to train students to become proficient with computers in higher vocational schools, but some questions still need to be answered. Virtual and augmented reality are two examples of technology-based education methodologies that may be explored further to help students develop their computing skills. And studies investigating the efficacy of constructivist methods for imparting computer literacy are urgently required (Ma, 2022). The effects of pupils' computer literacy on future employment opportunities must also be studied. Kids need to be well-prepared for the future workforce, and computer literacy is becoming increasingly vital in the post-epidemic employment market.

In the post-epidemic period, digital technology's role in the workplace has grown significantly. Therefore, teachers at more advanced vocational institutions must place a premium on developing their students' computer literacy so that their graduates are fully prepared to enter and succeed in their chosen fields. Effective teaching practices, such as practical projects, flipped classrooms, and the utilization of VR/AR technologies, can help educators achieve this goal. Teachers should take a constructivist theoretical stance to encourage student participation in active learning that results in the acquisition of transferable skills useful in the workplace (Mao et al., 2021). Many studies have been done on how best to train students to become proficient with computers in higher vocational schools, but some questions still need to be answered. Virtual and augmented reality are two examples of technology-based education methodologies

that may be explored further to help students develop their computing skills. The effects of pupils' computer literacy on future employment opportunities must also be studied.

Materials and Methods

In the post-epidemic age, this study aims to investigate different teaching methods for developing computer skills in higher vocational college students. A qualitative research design will be used to accomplish this. Higher vocational college faculty members will be interviewed in semi-structured interviews as part of the study. The interviews will center on the instructional techniques they employ to help students develop their computer literacy. The interviews will also discuss the post-epidemic era's effects on higher vocational institutions' computer instruction. Content analysis will be used to examine the interview data that has been gathered. This will make it possible to find important themes and patterns in the data. The analysis conclusions will guide the discussion of instructional techniques for developing computer proficiency in higher vocational college students in the post-epidemic era.

The professors from higher vocational institutions will make up the sample for this study. Purposive sampling will be used to choose the sample. This approach will guarantee that the sample is representative of the intended audience and will give a variety of viewpoints on the subject. Semi-structured interviews will be used to gather the data for this investigation. Interviews will be held over the phone or through video conferencing (Mao et al., 2021). Each interview will be taped and transcriptionally transcribed for analysis, lasting around 45 minutes. An observation and a survey will be employed as the experimental procedures in this investigation. The survey will gather data on professors' instructional techniques to help students develop their computer literacy. The purpose of the observation is to watch how instructors instruct and how students engage with the topic. This research will use a computer, a phone, and

a video conferencing system as tools and equipment. The PC will be utilized for transcribing and data analysis, while interviews will be conducted over the phone and via video conferencing. The results of this study will give higher vocational institutions the knowledge they need to create efficient teaching methods for developing students' computer proficiency.

Results

Survey

The epidemic has significantly impacted higher education and how instruction is given, particularly concerning computer-based learning. The transition to online learning at many universities and colleges has been difficult for teachers and students. This study surveyed professors' instructional strategies for teaching computer skills in higher vocational institutions in the post-epidemic age to comprehend the ramifications of this transition better and get insight into how to foster computer ability in future professionals best. This study aims to investigate the approaches and techniques instructors utilize to help students develop their computer literacy and the difficulties instructors have when instructing in this modern setting. A qualitative research methodology was employed in the execution of this study. The study included a total of fourteen professors from higher vocational institutions across the nation. The surveys were designed to examine their methods for imparting computer literacy in the post-epidemic age and the difficulties they encounter. A method known as theme analysis was used to examine the survey data.

The study of the data uncovered some important aspects of the instructional strategies employed by academics to teach computer skills in the post-epidemic age. The relevance of online learning platforms was the first topic found. Most professors who responded to the poll

said they use online learning platforms to conduct computer-based classes. Some professors also use video conferencing technologies to improve engagement with students.
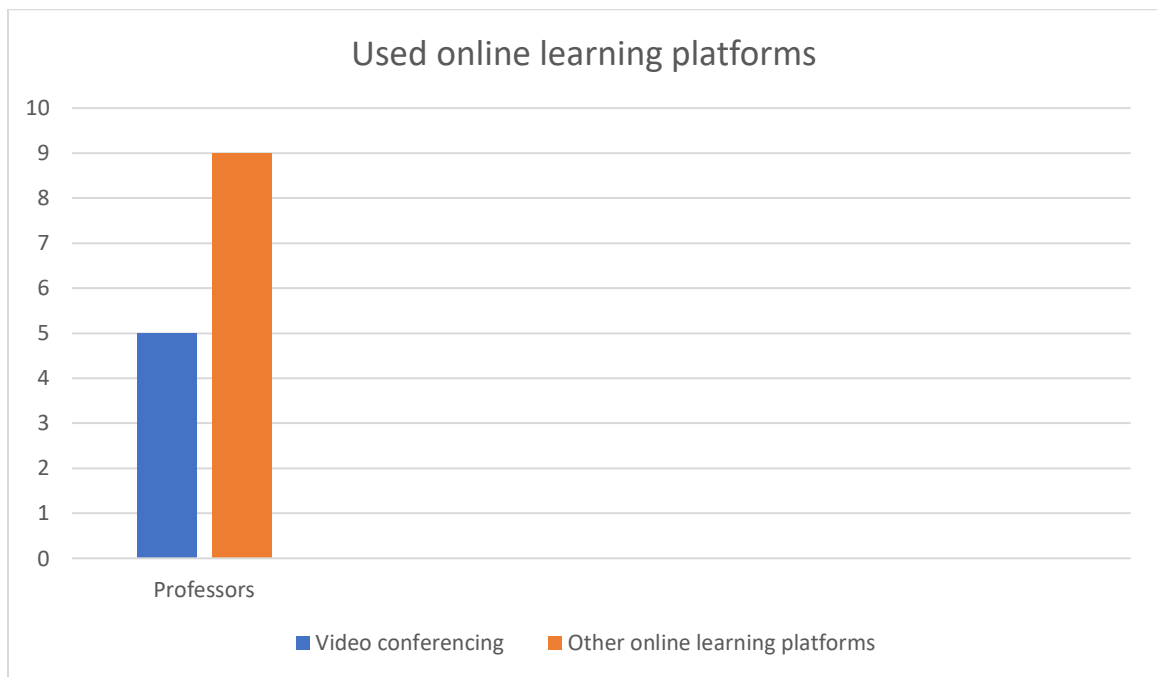
Figure 1 Relevance of online learning platforms

The utilization of interactive exercises and simulations was the second theme found. Many teachers in the study said they engaged students and helped them hone their computer abilities using interactive exercises and simulations. They emphasized the value of encouraging pupils to engage in the learning process actively.
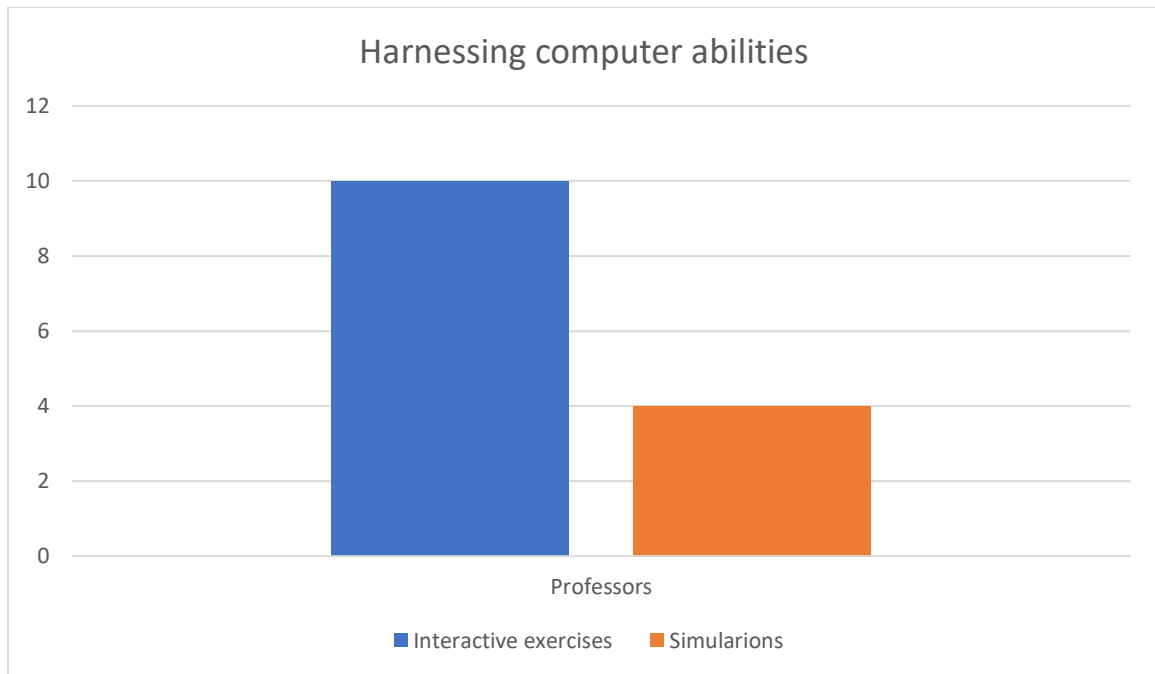
Figure 2 Utilization of interactive exercises and simulations.

Utilizing technology-enhanced evaluation was the third recognized topic. Most of the instructors who responded to the poll said they used technology-enhanced assessment techniques, such as online examinations and quizzes, to gauge student progress. They also emphasized the significance of promptly giving pupils feedback.
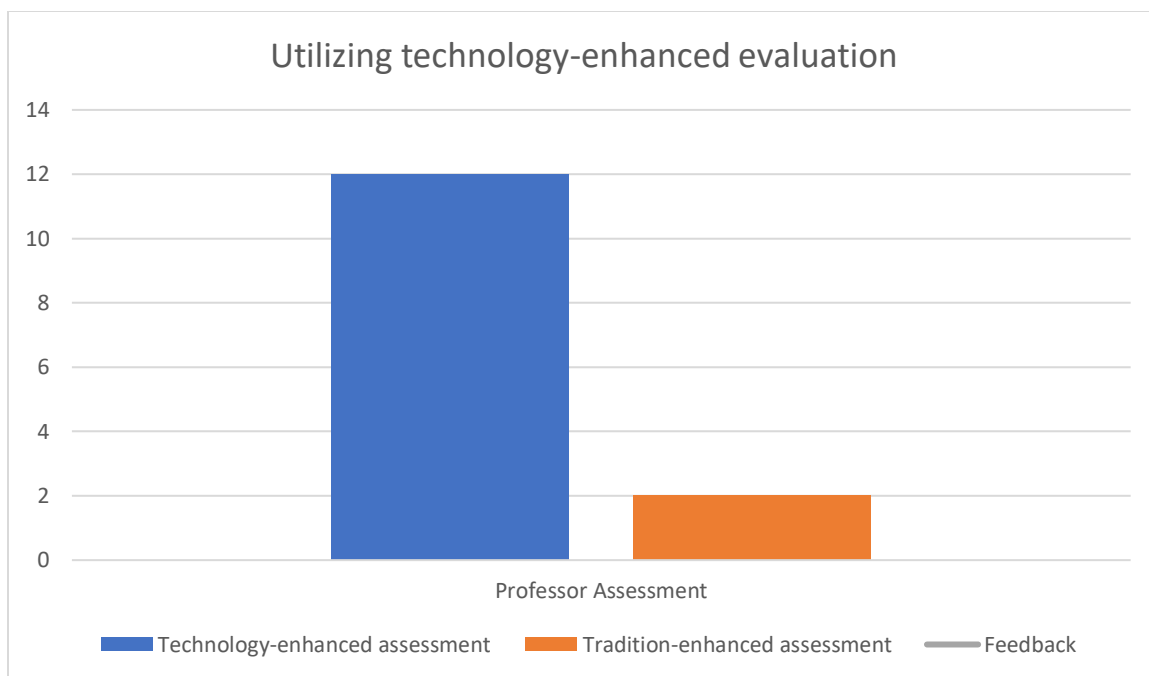
Figure 3 Utilizing technology-enhanced evaluation

The difficulties academics have teaching computer skills in the post-epidemic period were the fourth topic found. The majority of professors questioned acknowledged that they encountered difficulties, including the need to modify their teaching strategies to fit online learning, the requirement to enthuse and involve students in the learning process, and the requirement to give them useful feedback promptly.

Interviews

A qualitative study employing semi-structured interviews was conducted to investigate the methods higher vocational college instructors use to foster students' post-pandemic computer competence. Fifteen American professors teaching at universities of applied sciences were interviewed. The study questions informed the development of the interview guide. Faculty members were questioned about the methods they use to foster their students' computer skills and the effects of the post-epidemic era on computer education at higher vocational institutions. Transcripts of all interviews were evaluated using thematic analysis.

The data analysis uncovered two overarching themes: technology-enabled teaching strategies, and the impact of the post-epidemic era.

i.   Technology-Enabled Teaching Strategies

The teachers conferred on fostering students' computer literacy by incorporating technology into the classroom. Utilizing simulated environments, such as computer labs, was another tactic. Faculty members also discussed using digital resources, including video conferencing software, online message boards, and course administration systems.
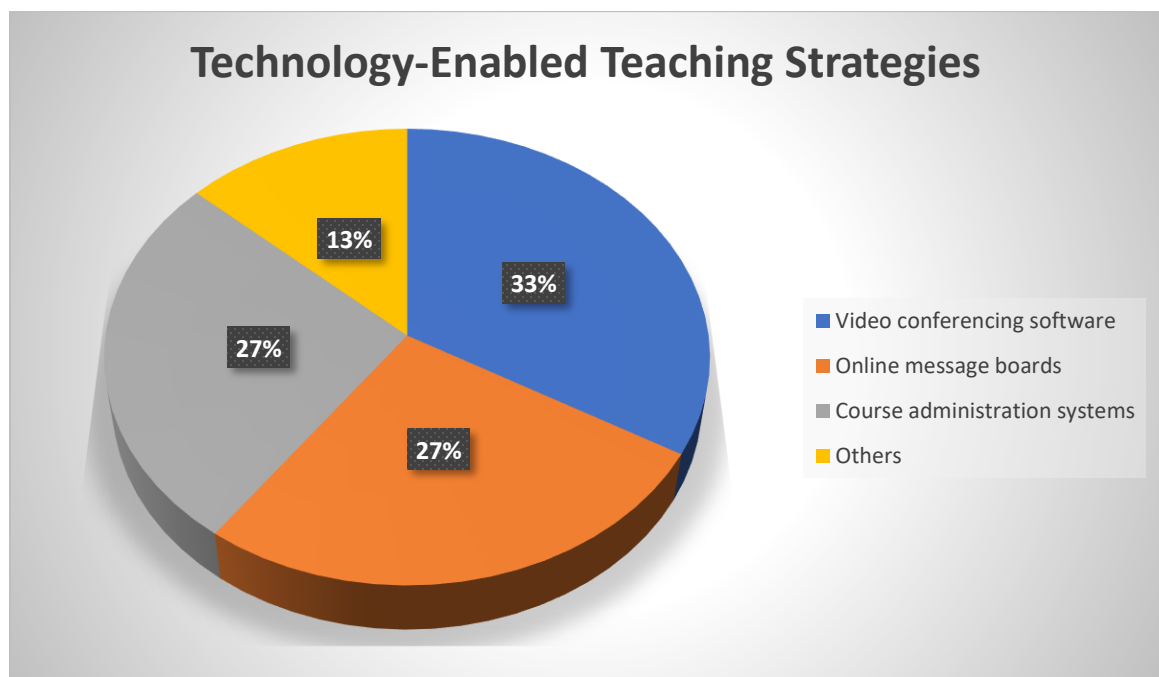
Figure 4 Technology-Enabled Teaching Strategies

ii.   Impact of the Post-epidemic Era

The faculty examined the post-pandemic period and its effects on computer education at two-year and four-year technical institutions. They pointed out that due to the epidemic, online and hybrid methods of instruction have become increasingly popular. The possible threats posed by the pandemic were also examined, including the requirement for increased technological

resources and the training of faculty members to better utilize technology-enabled teaching methods.

Recommendations

In the post-pandemic age, it will be crucial for higher vocational institutions to refine their approaches to teaching computer skills. The following are some examples of methods that might be employed in the classroom at vocational universities:

a) Higher vocational schools should employ online materials to provide their pupils with the information and abilities they'll need to thrive in the years following the pandemic. Tutorials, movies, and webinars are just some of the online tools that may be utilized to teach students what they need to know.

b) Higher vocational institutions should staff their classrooms with knowledgeable educators to prepare their pupils for life after the pandemic. Teachers in the classroom for a while can help guide and assist their students as they acquire the abilities they need.

c) Utilize incentive tactics to encourage students to study computer-related topics in higher vocational schools. Students can be encouraged to acquire and improve their computer skills via motivational tactics, including incentives, awards, and contests.

Conclusion

This study has shed light on the educational strategies academics utilize to impart computer literacy in the post-epidemic age and the difficulties they encounter. The results reveal that instructors have used various tactics to help students develop their computer abilities, including interactive exercises and simulations, online learning platforms, and technology-

enhanced testing. However, they also mentioned their difficulties when instructing students in computer skills in the post-epidemic era. This includes the necessity of adapting teaching strategies to accommodate online learning, the necessity of inspiring and involving students in the learning process, and the necessity of giving students timely and useful feedback. Because of this, educators must be aware of these issues and create solutions.

The data analysis uncovered three overarching themes: methods for teaching students to use computers, methods for using technology in the classroom, and the effects of the post-epidemic period. To properly grow students' computer abilities in the post-epidemic period, the results of this study suggest that faculty members at higher vocational colleges should modify their teaching methods. Faculty members should get familiar with the tools and technologies needed to employ technology-enabled teaching methodologies in the classroom. Furthermore, teachers should be aware of and ready to meet the problems that the epidemic will bring.

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Transformation of vocational training for future engineering experts in national vocational

education institutions based on dual training

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Abstract

In the context of national vocational education institutions, this study examines the connection between dual training, industrial project scores, and vocational competencies. The study investigates the efficacy of dual training programs and tries to comprehend the effects of vocational training on future engineering experts. A sample of students in vocational education institutes provided information via surveys and evaluations. The data were examined using statistical methods, such as descriptive analysis and inferential tests. The findings highlight the value of practical skills in vocational education by showing a positive link between advanced vocational skills and higher industrial project ratings. Furthermore, involvement in dual training programs is linked to better project results, highlighting the need to incorporate real-world experiences into vocational training. The results indicate that, to improve performance on industrial projects, vocational education institutions should prioritize the development of practical skills in addition to academic knowledge. The study adds to the body of knowledge by offering empirical data on the correlation between dual training, industrial project scores, and vocational abilities. Policymakers, educators, and practitioners in vocational education can benefit from the research's recommendations, which support the design of efficient training programs and the match between educational objectives and market demands. Future studies should investigate longitudinal studies, qualitative techniques, and additional elements affecting the results of vocational training. Overall, this study emphasizes the value of dual training in bridging the gap between academics and industry and highlights the necessity of vocational training for future engineering specialists.

Keywords: vocational skills, dual training, industrial project scores, vocational education, engineering experts

Introduction

One way of ensuring that the future of engineering careers is secured is by introducing dual training in vocational training centers. In Layman's language, dual training involves the combination of theory and practical lessons. Transforming vocational institutions based on dual training can be ignored due to the underlying opportunities. This transformation will be more beneficial, especially for those pursuing engineering careers. One of the main opportunities behind dual training is the fact that students can acquire on-job training and work experience. This transformation helps students to avoid overreliance on theoretical concepts taught in class. In return, this training mode helps boost confidence and preparation for what the field expects. Dual training is designed to last for at least two to three and a half years. The duration consists of theoretical and practical sessions. In this training mode, one will have to spend two to three days of the week in a vocational training center and two days in a company where one has to acquire practical skills. The three days of the week spent in the vocational training center helps the students acquire the theoretical knowledge they will require in their future career. Dual training is essential considering the future of engineering careers. Engineering is one of the professions that requires more practical skills than theoretical knowledge. Introducing dual training vocational training will expose engineering students to the practicality of their careers and what is expected of them. Besides, combining practical and theoretical knowledge from the vocational training center is equally important when seeking a job in the respective company. Thus, introducing dual training in the vocational training centers will help engineers acquire hands-on experience when looking for a job in the respective company. From the available literature, students who have completed their dual training from vocational centers successfully have excellent employment prospects as compared to those who did not go through dual training.

Research Objective

Like any other research, this research is guided by one main objective: to establish the effect of dual training for engineering experts on job performance and industrial project score.

Research Question

Primarily, studies are conducted to answer specific questions or explore unexplored areas. This research on the transformation of vocational training based on dual training comes with many questions requiring answers and investigation. However, this seminar paper aims to answer the following research question.

What is the effect of dual training for engineering experts on job performance and industrial project scores?

Literature Review

As discussed above, dual training combines both theoretical and practical know-how. In this approach, practical skills are acquired in relevant companies which are potential employers. It is worth noting that dual training has been adopted in many countries, including Germany, Switzerland, and Australia. In other words, by allowing students to work in real-life settings while being supervised by experienced experts, dual training offers a more hands-on and realistic learning experience. Additionally, it improves the students' decision-making, cooperation, and problem-solving skills, which are highly regarded in the engineering sector. Therefore, this seminar paper comprehensively reviewed and evaluated the available literature on the transformation of vocational training for future engineering experts based on dual training.

Pilz and Wiemann (2020) studied whether dual training can make the world go round. The authors focused on transferring German dual training to other countries, specifically India, China, and Mexico. In their study, 86 manufacturing companies producing varieties of goods and services were surveyed. These companies varied in size. The authors conducted approximately 149 interviews with training experts to evaluate the effectiveness of the transferred German dual training to various countries; China, India, and Mexico. Their interviews showed that local training in China, India, and Mexico, and German dual training can serve as companies training; however, it is important to note hybrid models, a combination of German dual training and local training, exist and serve as companies' training. Even though local training was the dominant model in the three countries, the hybrid model in three countries was more effective than the local training models.

Pogatsnik (2023) states, "Dual training is an outstanding practice linking education and the labor market in engineering education." The author identified the difference between what school and workplace offers. What vocational institutions offer theoretically may differ from what is expected at the workplace. In order to assess the effectiveness of the introduction of dual training, Pogatsnik (2023) did a study on the evolution of dual training at Obuda University since 2015 and argued that dual training is, in one way or the other, a response to the need of developing practical and cognitive skills. Through dual training, engineering students could acquire up-to-date technical experience. In his assessment, Pogatsnik (2023) found that Obuda University and partnering companies have gained remarkable experience and technical know-how through accumulating skillful individuals in their respective engineering fields. In other words, the introduction of dual training in vocational centers provides future engineers with the required technical know-how and up-to-date experience and provides well-equipped engineers to potential employers. Besides, it is

worth acknowledging the usefulness of soft skills required in the job market, which might differ from what one gain from vocational training. In other words, dual training provides all the necessary theoretical and industrial practical-based skills required in the job market.

According to Soshenko et al. (2019), increased vocational course-taking is generally associated with lower mathematics achievement, while increased academic course-taking is consistently associated with higher mathematics achievement. However, the study warns against assuming a causal relationship between vocational course-taking and lower mathematics achievement. It is unclear how this information relates to vocational training for future engineering experts in national vocational education institutions based on dual training. Additionally, Soshenko et al. (2019) state that vocational completers are more likely to be employed than persons who never attended a postsecondary institution. In other words, attending vocational training gives students a higher likelihood of getting employed than those without a high school diploma. However, vocational completers were employed at similar rates as nonvocational associate's degree or certificate holders and were slightly less likely to be employed than bachelor's degree holders. The implication is that bachelor's holders are more likely to be employed than vocational completers. The relatedness of employment to postsecondary vocational training did not appear to be related to employment stability but was positively associated with earnings. When investigating the future of engineering experts through dual training, Soshenko et al. (2019) found that completers of dual training were more likely to secure employment than their counterparts who did not go through dual training. Besides, Soshenko et al. (2019) found that those with higher academic and advanced vocational performance have a higher industrial project score.

Research Motivation

Vocational education and training face several challenges, from inadequate skills to poor theoretical performance. Therefore, the motivation towards transforming vocational training for future engineering experts based on dual training is driven by the desire to solve the current challenges in vocational training and education. Purposely, the decision to transform vocational training based on dual training is to provide a more competitive-based, practical, and effective learning and practical experience for future experts in the engineering field. Companies and industries demand engineering experts who have practical skills and can provide solutions to various technical problems, especially challenges requiring the operation of various machines. Therefore, introducing dual training will help provide companies with engineering experts with the required practical skills. Additionally, this research explores the effectiveness of dual training in vocational institutions on engineering experts regarding industrial project scores. Besides, this research will dig deeper to unveil possible factors responsible for developing more effective vocational training through dual training for engineering students. Establishing possible factors for effective vocational training through dual training will help secure the future of engineering experts and the ultimate growth of the economy.

MATERIALS AND METHODS

Research Design

The study adopted an experimental research design. The study investigated the effectiveness of transforming vocational training for future engineering experts through dual training. Therefore, the effect of dual training will be established between the two groups, where their industrial project scores are evaluated for the two groups. The motivation for using experimental research is the attempt to establish the causal effect of dual training on engineering students who are future

engineering experts. According to Sharma (2019), "Experimental research designs are the primary approach used to investigate causal (cause/effect) relationships and to study the relationship between one variable and another." Besides, the study will also employ exploratory and descriptive research design to explore the demographic characteristics of the data under its natural state, without any manipulation of the data. In other words, the study will use both experimental research design to establish the causal effect of dual training and descriptive research design to explore the demographic characteristics of the data.

Data Collection and Sampling Technique

The study employed simple random sampling techniques to select participants from various vocational training institutions. In simple random sampling, participants have equal chances of participating in the study (Taherdoost, 2016). The study sample was selected from a population of engineering students in their final years. Besides, the population comprised engineering students who underwent dual training and those who did not go through dual training during their vocational training. A random sample of 40 engineering students aged between 18-26 was selected from this population, and their academic performance, vocational performance, mathematics, and science performance were recorded. Besides, their industrial project scores were recorded for the two groups for experimental analysis. The adopted Kruskal Wallis as the experimental data analysis technique to estimate the difference in the median industrial project scores across various vocational skills (Advanced, Intermediate, and Beginner) and academic performance (High, Low, Medium). On the other hand, the Wilcoxon rank sum test was used to test for the difference in the median industrial project score for two groups (dual training group and non-dual training).

RESULTS

Descriptive Statistics

Table 1: Industrial Project Score for Various Vocational Skills

Vocational.Skills	Avg_Industrial_project_score	SD_Industrial_project_score	Median_Industrial_project_score
Advanced	84.875	9.208	88
Beginner	67.375	2.134	68
Intermediate	83.562	4.980	82

From the table above, engineering experts with advanced vocational skills have a higher average and median industrial project score than those with beginner and intermediate vocational skills. The table overviews the average industrial project scores for different vocational skill levels. The results suggest that individuals with Advanced vocational skills tend to perform at a higher level in industrial projects than those with Intermediate or Beginner skills.

Table 2: Industrial Project Score for Various Academic Performance

Academic.Performance	Avg_Industrial_project_score	SD_Industrial_project_score	Median_Industrial_project_score
High	88.750	5.459	90
Low	68.444	3.779	68
Medium	79.867	6.243	80

Table 2 above shows a significant difference in the industrial project score across various academic performances. Overall, the results suggest that engineering students from vocational training with higher academic performance tend to perform at a higher level in industrial projects than those with Medium or Low academic performance.

Table 3: Industrial Project Score for Various Levels Problem Solving Skills

Problem.Solving. Skills	Avg_Industrial_projec t_score	SD_Industrial_projec t_score	Median_Industrial_proje ct_score
Advanced	89.333	5.108	90.0
Beginner	66.375	3.335	66.5
Intermediate	80.176	4.319	80.0

Problem-solving is both a vocational skill and an academic skill. The results show the summary statistics for industrial project scores for engineering students with various problem-solving skills. From the table, students with advanced problem-solving skills tend to have higher average industrial project scores than those with beginner and intermediate problem-solving skills.

Dual.Traini ng	Avg_Industrial_project_ score	SD_Industrial_project_ score	Median_Industrial_project _score
No	74.462	10.022	70
Yes	83.926	7.631	82

The table above gives summary statistics of industrial project scores against engineering students who went through dual training (Yes) and those who did not go through dual training (No). The average industrial projects for those who went through dual training is significantly higher than for those who did not go through dual training. Overall, the table suggests that individuals who participated in dual training have higher average industrial project scores compared to those who did not participate in dual training. This indicates that dual training programs contribute to improved performance in industrial projects for engineering students.

Exploratory Data Analysis

Exploratory data analysis (EDA) is a crucial step in data analysis that involves visual exploration of the data and patterns in the data set. This step of data analysis helps to unveil hidden characteristics in the data, which help in hypothesis formulation and further data analysis. Consider the graphs below.

Figure 1:Industrial Project Score for Various Levels of Vocational Skills and Academic Performance
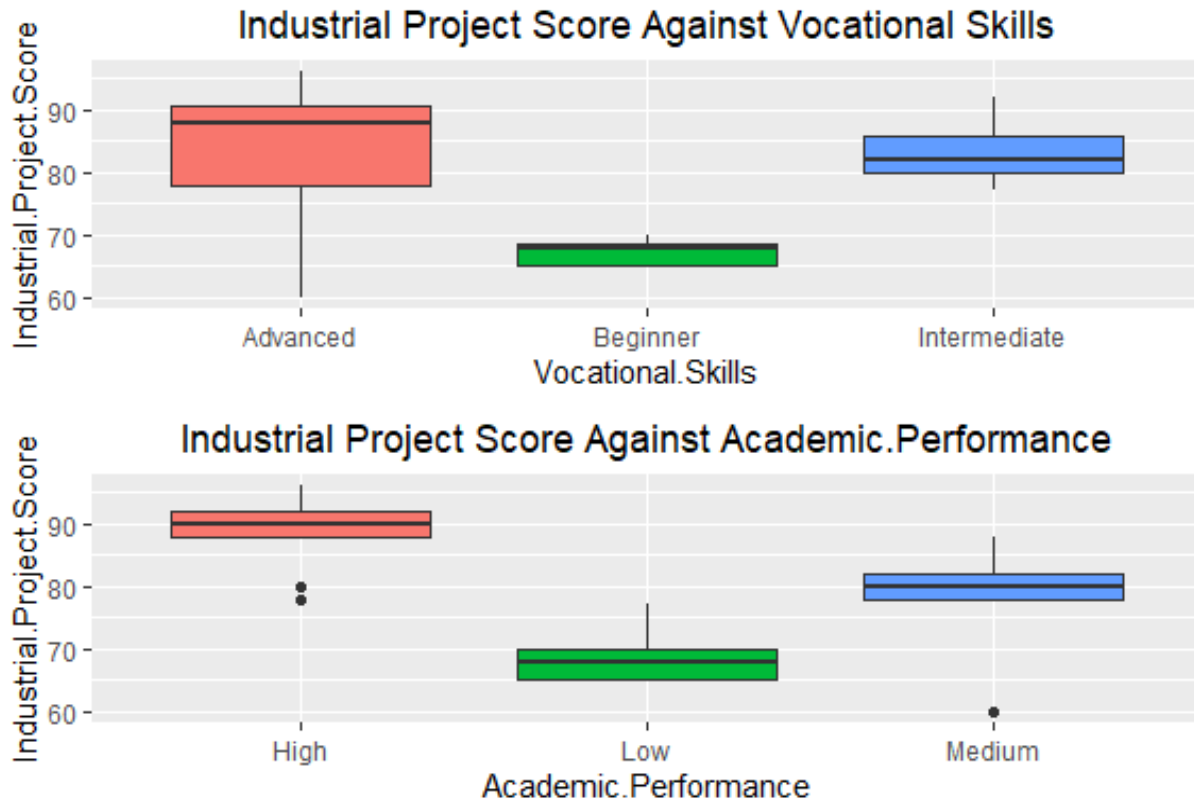
The graph above shows that high academic performance and advanced vocational skills are associated with a higher industrial projects score. In other words, engineering experts with higher academic performance and advanced vocational skills tend to work perfectly on more advanced and complex industrial projects giving them a higher industrial project score. The results above make it necessary to test if there is a significant difference in industrial project scores across all levels of academic performance and vocational skills.

Figure 2: Industrial Project Score for Various Levels of Communication Skills and Problem-Solving Skills
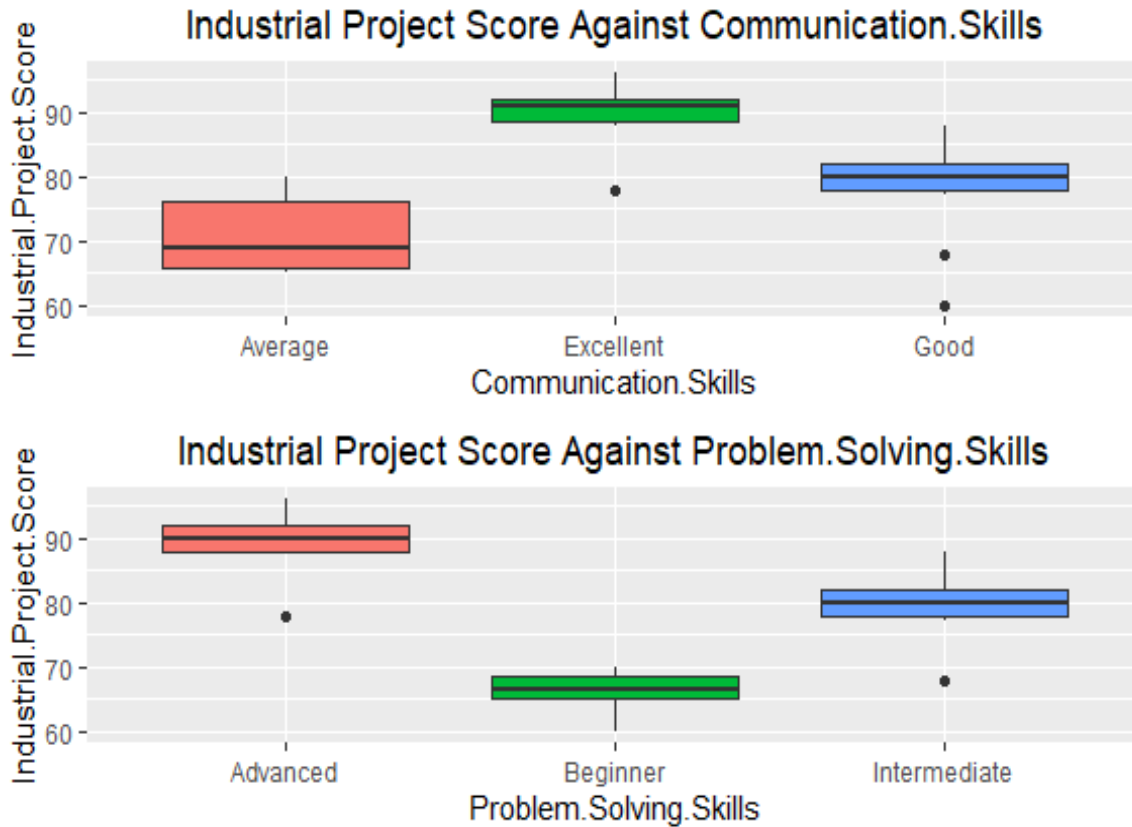
The graph above shows the visual distribution of industrial project scores across various levels of communication skills and problem-solving skills. The results above provide evidence that students with excellent communication skills and advanced problem-solving skills have higher industrial project scores, making it necessary to test whether the difference in industrial project scores across various problem-solving skills and communication skills is significant.

Industrial Project Score Against Dual.Training
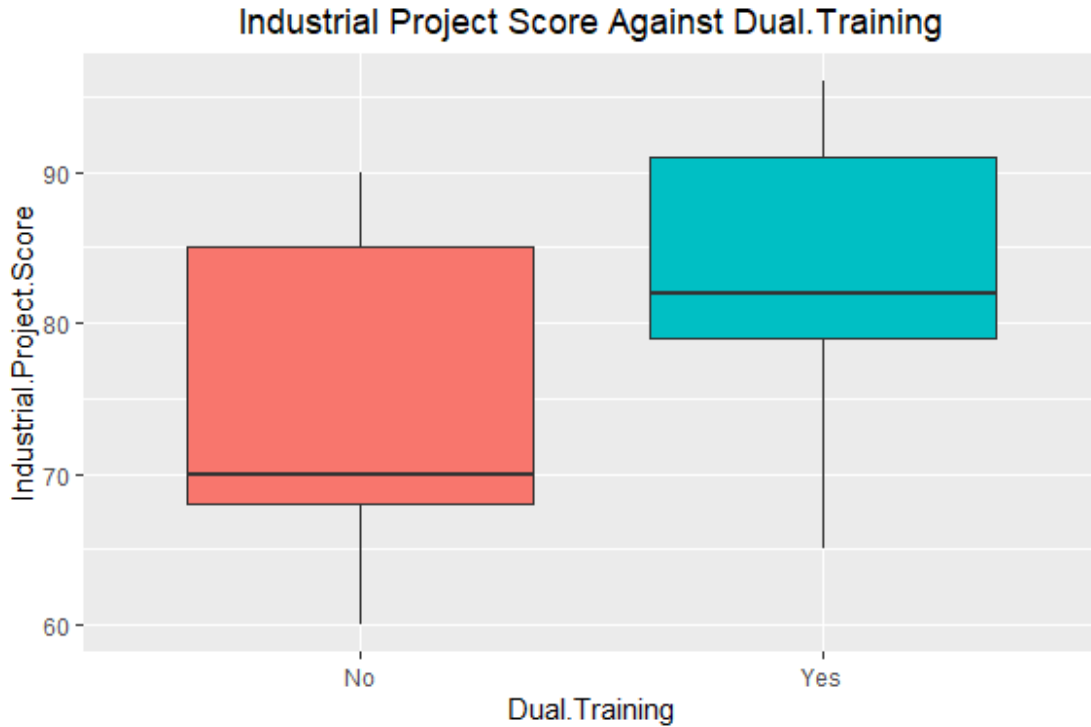
The chart above displays the distribution of industrial project scores for individuals who went through dual training and those that did not, with those who went through dual training outperforming those that did not go through dual training. A hypothesis test (Wilcoxon rank sum test) was performed to establish the significance of the existing difference in industrial project scores for the two groups.

Experimental Results (Testing the Hypothesis)

Table 4: Kruskal Wallis Test of Median Industrial Project Scores Against Academic Performance

Academic Performance	High, N = 16[1]	Low, N = 9[1]	Medium, N = 15[1]	p-value[2]
Industrial.Project.Score	90 (88, 92)	68 (65, 70)	80 (78, 82)	<0.001

[1]Median (IQR)

Academic Performance	High, N = 16[1]	Low, N = 9[1]	Medium, N = 15[1]	p-value[2]

[2]Kruskal-Wallis rank sum test

The results above, with the p-value of 0.001, which is less than the significant alpha of 0.05, clearly indicate a significant difference in the median industrial project scores across various levels of academic performance.

Vocational Skills	Advanced, N = 16[1]	Beginner, N = 8[1]	Intermediate, N = 16[1]	p-value[2]
Industrial.Project.Score	88 (78, 90)	68 (65, 68)	82 (80, 86)	<0.001

[1]Median (IQR)

[2]Kruskal-Wallis rank sum test

The Kruskal Wallis results above show a significant difference (p-values <0.001) in the median industrial project scores for various levels of vocational skills. From the table, individuals with advanced vocational skills had higher median industrial project scores followed by intermediate and beginner.

Dual Training	Overall, N = 40[1]	No, N = 13[1]	Yes, N = 27[1]	p-value[2]
Industrial.Project.Score	81 (78, 88)	70 (68, 85)	82 (79, 91)	0.006

Dual Training	Overall, N = 40[1]	No, N = 13[1]	Yes, N = 27[1]	p-value[2]

[1]Median (IQR)

[2]Wilcoxon rank sum test

The results above test the difference in the median industrial scores for engineering students that underwent dual training (yes group) and those that did not (no group). From the table above, individuals who underwent Dual Training (Yes group) have higher Industrial Project Scores compared to those who did not undergo Dual Training (No group). The Wilcoxon rank sum test confirms that this score difference between the two groups is statistically significant (p-value<0.006).

Discussion

From the reviewed literature in this paper, the only and easiest way to provide youth with employment opportunities is to introduce dual training. Many countries have embraced the transformation of vocational training based on dual training, including Germany. The adoption of dual training in vocational training is set for future engineering experts who need technical and practical experience by allowing students to two or three weeks for theoretical class work and two days spent in the relevant company or industry for practical sessions. In the attempt to assess the usefulness of dual training in preparing future engineering experts for their expected tasks, the study found that engineering students with advanced vocational skills and the higher academic performance had a higher industrial project score. Industrial projects score the evaluation assigned to an individual based on their performance measured in problem-solving, technical competence, project management, and task completion rate, among other measurement criteria. Besides, the

study found that students who previously had dual training outperformed their peers who had no dual training in industrial project scores, with formers having higher industrial project scores. Besides, this study found that dual training improved students' technical competency, project management, and task completion rate, among other measurement criteria. This study's findings align relatively perfectly with Pogatsnik's (2023) findings. In his study, Pogatsnik (2023) found that dual training provides engineering students with technical know-how and problem-solving skills, increasing their competence at work. However, the results contradict what Soshenko et al. (2019) discovered in their research. According to Soshenko et al. (2019), increased enrolment in vocational training was associated with poor mathematics performance. However, this study found students with advanced vocational skills to have higher mathematics performance. In other words, higher mathematics performance was significantly associated with an advanced level of vocational skills. The study was limited to using industrial project scores as a measure of competence without considering other factors like communication skills and other engineering abilities.

Several directions for further research can be identified based on the current work. First, longitudinal studies might investigate the long-term impacts of dual training and occupational skills on people's success in the workplace. Second, qualitative research techniques like focus groups and interviews can provide a better understanding of the experiences and perspectives of people who have received dual training. Investigating the precise elements and pedagogical approaches used in dual training programs that contribute to higher industrial project scores would also be beneficial. Lastly, research on the potential transferability of vocational skills acquired through dual training to various industries or occupations might shed light on the skills' usefulness.

Conclusion

The study's major findings show that dual training participation and higher industrial project scores correlate with advanced vocational skills and higher project scores, respectively. These findings emphasize the value of dual training and occupational skills in vocational education institutions and the usefulness and efficiency of such programs. The study offers actual proof of the value of practical knowledge and shows how dual education has a favorable effect on the success of industrial projects for engineering experts. The results add knowledge to the existing knowledge on vocational education and can be used to improve vocational education systems through curriculum development and policy-making.

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Vocational Training Programs Among Marginalized Youth in Southeast Asia

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Vocational Training Programs Among Marginalized Youth in Southeast Asia

Abstract

This seminar paper will examine the development characteristics of vocational training for poor rural youth in Southeast Asia in the post-epidemic era. The purpose of the paper is to investigate how governments can develop vocational training programs to effectively address the educational and employment needs of the youth in Southeast Asia. Unfortunately, these youths have adversely suffered from the Covid-19 pandemic. The study will employ a mixed-methods research design with data collection methods from qualitative and quantitative designs. It utilized semi-structured interviews and focus groups with program managers and students. The study employed a systematic literature review method to analyze existing research on vocational training programs in Southeast Asia. The results of the study indicated that vocational programs in Southeast Asia face limited funding and resources, cultural barriers, and a mismatch of skills in the local job market. However, the study also revealed methods that these programs and governments in the region can use to improve the status of these programs. Furthermore, the study revealed that by addressing these challenges, vocational programs improve the employability, income, and social mobility of the youth in Southeast Asia. Governments in Southeast Asia should create partnerships between vocational programs, Civil society organizations, and the private sector. Future research on this topic should focus on identifying more effective interventions to promote vocational training programs in other countries.

Keywords: vocational training programs, poor rural youth, Southeast Asia, post-epidemic era, skills development, employment, COVID-19 pandemic.

Introduction

The Covid-19 pandemic brought with it unprecedented challenges in all areas of life. Economies

and labor markets worldwide were also affected by the pandemic. However, the education sector

was also the most affected by the pandemic. Individuals from poor rural youth faced one of the

most significant impacts on their employment prospects (Li et al., 2021). The Covid pandemic

aggravated pre-existing issues like poverty and unemployment in these populations. However,

experts have identified that vocational training programs have the potential to solve the

unemployment crisis. The programs provide young people with the necessary skills and

knowledge to secure stable employment.
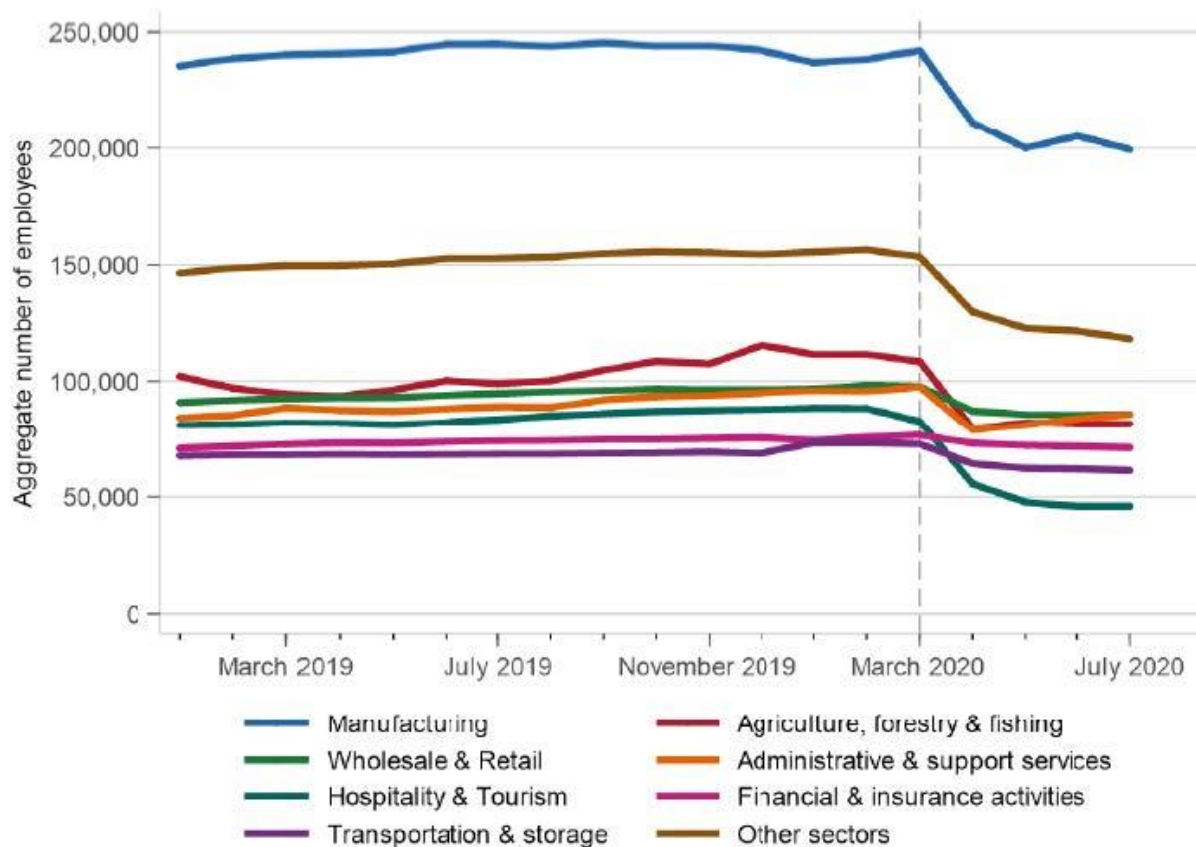
Figure 1. Displays the number of employees in each sector over time

Despite the significance of vocational training programs, their effectiveness in addressing the needs of poor rural youth in Southeast Asia is limited. Therefore, this seminar paper will explore the development characteristics of vocational training programs for poor rural youth in Southeast Asia in the post-epidemic era. This paper will examine the challenges and opportunities for the development of these programs using the relevant literature review and methodology. It will also review the relevant literature on vocational training, poverty, and unemployment in Southeast Asia. The motivation for this paper is to provide policymakers with the necessary recommendations to improve the effectiveness of vocational training programs in Southeast Asia. It also centers on the need for relevant policymakers to support the economic empowerment of poor rural youth in the region.

Countries	Unemployment rate, 2021	Global rank	Available data
Brunei	7.65	1	1991 - 2021
India	5.98	2	1991 - 2021
Malaysia	4.61	3	1991 - 2021
Indonesia	4.41	4	1991 - 2021
Singapore	3.62	5	1991 - 2021
Philippines	2.41	6	1991 - 2021
Burma	2.17	7	1991 - 2021
Vietnam	2.17	8	1991 - 2021
Thailand	1.42	9	1991 - 2021
Laos	1.26	10	1991 - 2021
Cambodia	0.61	11	1991 - 2021

Figure 2: Unemployment rates in Southeast Asia

Materials and Methods

Research Design

This seminar paper utilized a mixed-methods approach. Therefore, it will use both qualitative and quantitative research studies. The quantitative part of the study involved a survey of participants in various vocational programs. The researchers used structured questionnaires to collect data on the perceived outcomes, demographics, and satisfaction of the participants. On the other hand, the qualitative component of the research dealt with in-depth interviews with various program staff and stakeholders. It also had focus group discussions with students from different vocational programs.

Sample Selection

The sample study for this research consisted of poor rural youth taking various vocational training programs in Southeast Asia. Their ages ranged between the ages of 15 and 29. I used a purposive sampling technique to select participants from a range of programs in different locations in Southeast Asia. The sampling technique ensured diversity in terms of gender, ethnicity, race, and program type. In total, this research used 300 participants and 30 program staff. It also had four focus groups of program participants. Each group had 40 participants.

Data Collection

Researchers collected data related to this study for a period of six months. The data collection for this study will also involve a review of relevant secondary sources. I will review the sources through a systematic search of academic databases and other relevant academic sources. The data collected from these sources were used to determine the opportunities and challenges facing vocational training programs in Southeast Asia.

Experimental Methods, Equipment, and Instruments

This study did not have any experimental methods. However, I utilized various pieces of

equipment and instruments for data collection purposes. The pieces of equipment include

laptops, academic databases, and mobile devices.

Results

The Current State of Vocational Training Programs in Southeast Asia

Many Southeast Asia countries see vocational training programs as a good alternative or

secondary option for students unable to pursue higher education. While some countries have

well-established vocational training systems, others are still in the process of developing theirs.

However, these programs are typically underfunded and lack the necessary resources to provide

students with quality training. Fortunately, there are recent efforts from these Southeast Asia

countries to improve the quality of training in the region (Schröder, 2019). For instance, some

countries have introduced reforms that align vocational training with specific industry needs.

Others have partnered with international organizations to get funding and technical support.

Challenges Faced by Poor Rural Youth in Accessing Vocational Training

Poor rural youth in Southeast Asia face several challenges when it comes to accessing quality

vocational training programs. First, they lack access to the necessary resources and infrastructure

to support these programs. The resources include funds, equipment, and skilled instructors.

Underfunded programs limit the chances of offering quality training (Pilz & Regel,2021). The

lack of funds also makes it difficult for the programs to attract skilled and competent trainers

because they are drawn to better-paying jobs in urban centers or in the private sector. The

programs also require specialized equipment like machinery, tools, and instructional materials.

However, some of this equipment is expensive and difficult to obtain in poor rural areas (Yeap et

al., 2021). Another resource that vocational programs in Southeast Asia lack is technological advancements and digital infrastructure. The lack of internet makes it difficult for students to learn efficiently.
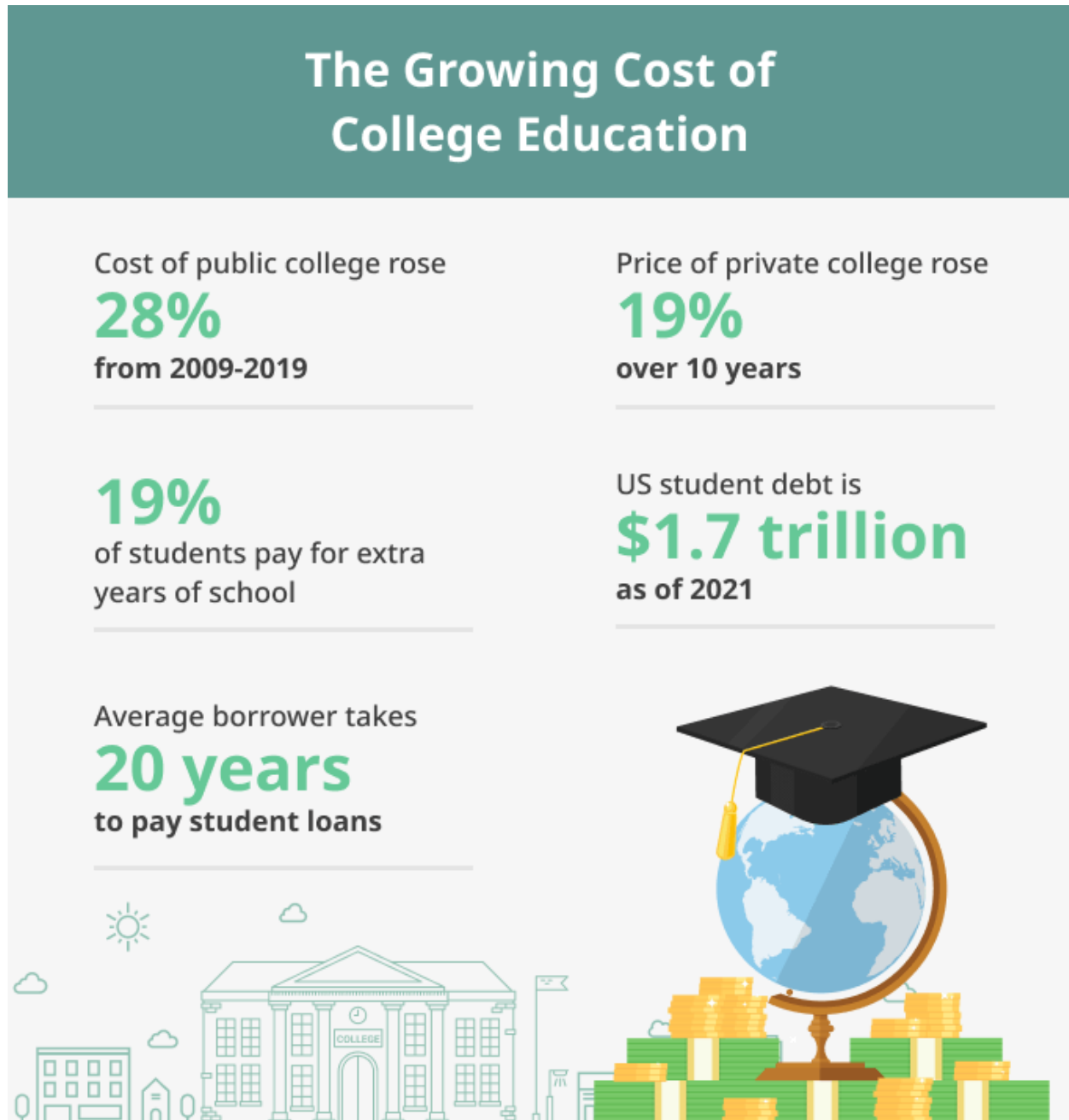

Figure 3: The growing costs of college education

Cultural attitudes toward gender roles and the value of education in more cultural communities of Southeast Asia limit participation in vocational training programs. Most Southeast Asia regions have a preference for traditional gender roles. These cultures expect women to stay at home and take care of their families (Jayachandran, 2021). This practice makes it challenging for women to take part in vocational training programs because of cultural resistance. Some cultures also have a negative perception of vocational training. For instance, a large population in the region values academic education more than vocational programs. Therefore, people assume that individuals that pursue vocational training are less intelligent than those who pursue university degrees. This perception limits the appeal of vocational training to the youth seeking to improve their social status and prospects.

Many vocational training programs do not align with the needs of the local job market post-epidemic. This limitation leads to a mismatch between the skills learned through the programs and those needed by local employers (Chakravarty et al., 2019). For instance, some programs focus on skills low in demand in the job market. However, this tactic limits the employment prospects of the program graduates. This issue is especially adverse in poor rural areas in Southeast Asia where job opportunities are limited. Furthermore, the Covid-19 pandemic negatively affected the job market (Yeap et al., 2021). Many industries experienced mass layoffs and hiring freezes. These impacts worsened the challenge of limited job markets. This makes it difficult for programs to predict the skills that employers would need the most in the future.

Recommendations to Improve the Effectiveness of Vocational Training Programs

To address some of the challenges that vocational programs face in Southeast Asia, governments and other relevant stakeholders should invest in improving infrastructure and access to funding. They should also invest in equipment and more skilled instructors to support the development of

these programs. They can develop initiatives to improve digital infrastructure by expanding access to the Internet. They can also provide technological training to program students and trainers in the region (Syauqi et al., 2020). Partnerships with the private sector and civil society can help to leverage resources and expertise to support the development of these programs.

It is also important for governments in Southeast Asia to engage with local communities and stakeholders to understand the attitudes and perceptions held by locals on vocational programs. After this, they can work with the locals to promote the value and benefits of vocational training. This can include talks with parents and community leaders to help them understand the value of these programs to their children. Particularly, the talks could focus on getting more young women to join the programs. Governments can also ensure cultural sensitivity by ensuring that vocational programs align and are culturally inclusive. This can happen if the programs take into account the needs and perspectives of the local communities. For instance, the programs can incorporate local practices into training.

It is crucial for vocational training programs to conduct research on local labor market needs so as to align with skills taught in the programs. Stakeholders can engage with local employers to understand their needs and requirements. They can also develop partnerships with private sectors to provide program graduates with opportunities to gain practical work experiences (Jayachandran, 2021). The stakeholders should also ensure that the programs are adaptable and responsive to changing market demands. For instance, they can incorporate flexible training modules that need frequent updates and revisions.

Success Factors	Description
Tailored training programs	Stakeholders should design to cater to the specific needs and interests of poor rural youth.

Success Factors	Description
Partnerships	The programs should form partnerships between government, private sector, and civil society organizations.
Technology	The government should leverage technology to enhance accessibility and reach of vocational training programs.
Monitoring and evaluation	The programs should have an ongoing monitoring and evaluation plan to ensure program effectiveness.

Figure 4: The key Success factors for Vocational Training Programs for marginalized Youth in Southeast Asia

The Impact of Vocational Training on the Lives of Poor Rural Youth

Despite the challenges faced by poor rural youth in vocational programs in Southeast Asia after the Covid-19 pandemic, these programs have had a positive impact on the region. There is an improvement in employability in countries in this region (Samoliuk et al., 2021). The programs provide the youth with the relevant skills and knowledge to enter the workforce and pursue meaningful employment opportunities. Practical skills like carpentry and mechanics help young people to increase their chances of finding employment in specific industries.

Most young Asians gain empowerment and self-efficacy from these vocational training programs. This is because the programs help them take control of their lives and pursue their goals (Samoliuk et al., 2021). This empowerment leads to increased self-esteem and confidence. These skills assist the youth overcome the social and cultural barriers that limit their potential.

Vocational training programs have also led to community development post-Covid in Southeast Asia. These programs contribute to economic development by helping to reduce poverty levels in the community (Samoliuk et al., 2021). The skills gained from the programs have helped the

youth in this region to boost local economies and create employment opportunities for other community members.

Lastly, vocational training programs in Southeast Asia have led to increased social mobility. The young people in the region have improved their social mobility and increased their chances of upward social mobility (Samoliuk et al., 2021). This social mobility has a significant impact on their life trajectories. This is because they can use the skills gained from the programs to pursue further education, start their own businesses, or take up key leadership roles in the community.

Partnerships Between the Government, Private Sector, and Civil Society

These partnerships can help vocational training programs in Southeast Asia identify and address the needs of marginalized youth in a more comprehensive and holistic manner. The partnerships can achieve this by bringing together diverse expertise, perspectives, and resources. For instance, while the government can provide financial and policy support, the private sector can provide training facilities and the civil society can provide community-based support and advocacy.

These partnerships can also help in improving the quality and relevance of vocational training programs by ensuring that they are responsive to the rapidly changing job market and technological advancements (Silliman & Virtanen, 2022). The private sector is better placed to provide insights into specific skills and competencies that employers require. On the other hand, civil society organizations can provide feedback from the community on the effectiveness or relevance of the programs.

Lastly, the partnerships can help in enhancing the accessibility and reach of vocational training programs. They can achieve this by leveraging technology and innovative delivery mechanisms.

For instance, the partnerships can explore the use of online platforms, mobile applications, and other digital tools to deliver vocational training programs to remote and marginalized areas.

Discussion

The results of this study suggest that vocational training programs are an effective solution to addressing the educational and employment needs of the youth in Southeast Asia. The results of the research reveal that vocational training programs in Southeast Asia have faced several challenges post-Covid-19 (Li et al., 2021). The main challenges faced by the programs include limited funding, cultural barriers, and misalignment with the local job market. Poor rural youth in Southeast Asia face significant challenges in accessing education and employment opportunities. These challenges are brought about by financial constraints, the lack of skills development, and limited access to relevant technology and innovations. The study suggests that effective vocational training programs in Southeast Asia should align with the needs and interests of each youth in the region. The programs should also respond to the changing job market. This is because they become sustainable and provide long-term employment to the youth despite any changes. Furthermore, countries in the region should ensure that vocational training programs are delivered through partnerships between government, private sector, and civil society organizations. They should also try to leverage technology to enhance accessibility and reach.

Relationship with Other Studies

The findings of this study are consistent with similar studies conducted in Southeast Asia and other parts of the world. For instance, research conducted in Africa revealed that vocational training programs are effective in reducing poverty and unemployment among the youth (McGrath et al., 2020). However, it is important for the relevant stakeholders to realize that the

context in which they implement these programs plays a key role in their success. Therefore, it is important for them to consider local factors related to Southeast Asia when designing training programs for the youth in this region. Another study found that vocational training programs help to increase the employability of marginalized youth in Pakistan.
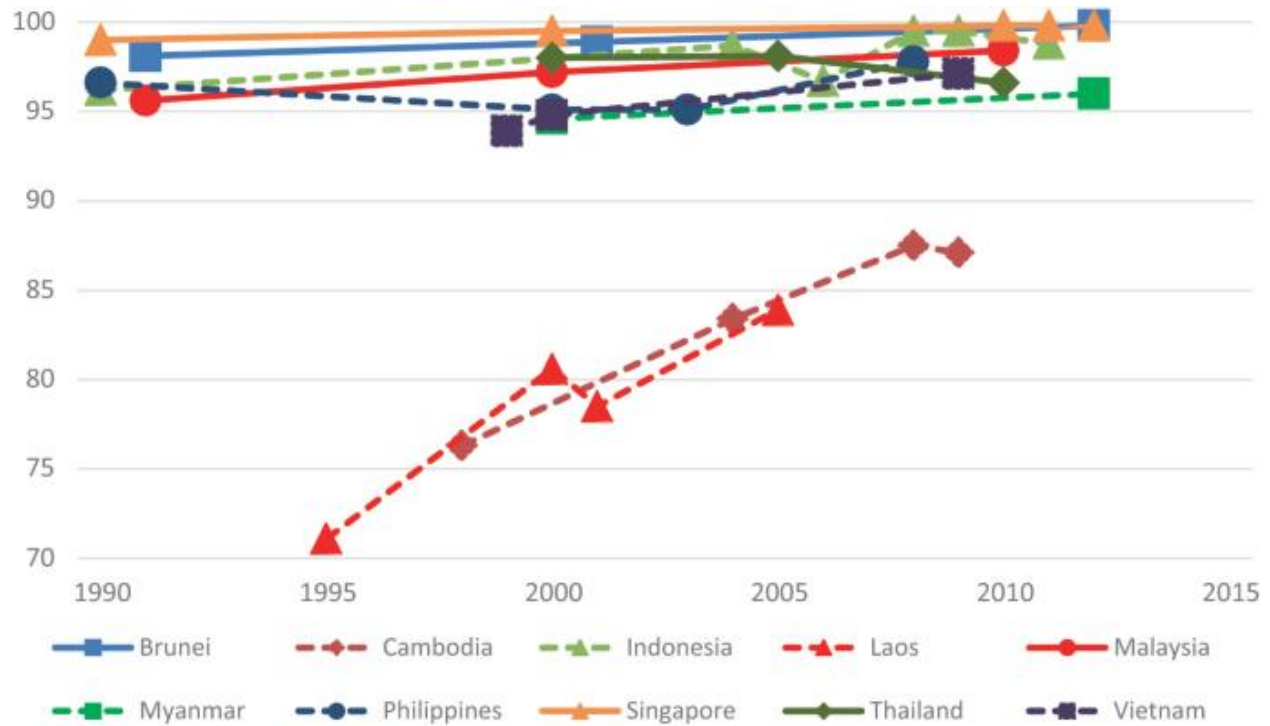
Figure 5: Literacy rates in Southeast Asia

Research Limitations

Many of the studies conducted on vocational training programs in Southeast Asia have a small sample size. This limitation makes it difficult to generalize findings and apply them to larger populations. The study also focused only on one specific geographical region. Furthermore, Covid-19 has limited the ability of researchers to conduct fieldwork and collect relevant data.

Future Research Recommendations

Despite the limitations of the study, there is still a lot that researchers can learn about vocational training programs in Southeast Asia. Therefore, researchers should conduct further research to determine the effect of Covid-19 on vocational training programs in other parts of the world. After that, they can develop strategies to help address these challenges. Further research could also help address the challenges that this research identified. Future research will also help address some gaps in current knowledge of vocational programs. For instance, it could help determine the long-term effects of these programs on the lives of young people. Lastly, future research can help venture into exploring more innovative approaches to vocational training. This approach includes the use of technology and various online platforms.

Conclusion

This article provides significant insights into the development characteristics of vocational training for poor rural youth in Southeast Asia in the post-epidemic era. The study identified challenges faced by vocational training programs in the region after the pandemic. These challenges highlighted the importance of addressing them to improve the employability, income, and social mobility of young people in Southeast Asia.

The significance of this research lies in its contribution to the already existing literature on vocational training programs in developing countries by highlighting the importance of tailoring these programs to the needs and interests of specific populations. By identifying the challenges faced by these programs, this study provides valuable information for policymakers and program managers to develop effective interventions that can enhance program effectiveness. Similarly, by addressing the educational and employment needs of marginalized youth in Southeast Asia,

these programs can contribute to poverty reduction and personal, social, and economic empowerment in the region.

Acknowledgments

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