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THE IMPACT OF TEACHING AND LEARNING METHODS DURING COVID-19 ON THE MASTERY LEVEL OF TECHNICAL SKILLS OF TECHNICAL AND VOCATIONAL EDUCATION STUDENTS

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Abstract:

The COVID-19 pandemic profoundly impacted educational systems worldwide, including Technical and Vocational Education and Training (TVET). The shift from traditional classroom-based learning to online or hybrid models presented unique challenges, especially for fields that heavily rely on hands-on, practical experience to develop technical skills. Online learning became a big challenge for TVET students. This is because TVET students require more practical experience in addition to theoretical knowledge. As a result of movement and other physical constraints, technical skills could not be honed during the Covid-19 period. Thus, this study was conducted to identify the mastery level of technical skills of TVET students when the Covid-19 broke out. In addition, this study was also conducted to identify suitable teaching and learning methods that can be used during the pandemic period for mastering technical skills. A random sampling method was used and a total of 86 respondents were recruited from TVET students in year 4. This study is quantitative method, and the research instrument used is a questionnaire survey form. The data obtained were analysed using the Statistical Package Social Sciences (SPSS) software version 26.0. The findings

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of the study showed that the students' mastery of technical skills was at a moderate level; and the use of teaching and learning methods during the Covid-19 period was also at a moderate level. The researcher expects that this study will help in providing information to certain parties in order to increase the mastery level of technical skills as well as improving the teaching and learning styles, should unexpected situations occur again.

Keywords:

Covid-19, Technical Skills, Teaching and Learning

Introduction

The COVID-19 pandemic has marked a pivotal moment in human daily life, ushering in unprecedented changes and restrictions on activities involving crowd gatherings globally. This global health crisis has particularly left an indelible impact on the education sector, both in Malaysia and worldwide. The enforcement of the first Movement Control Order (MCO) on March 18, 2020, highlighted how individuals, especially students across all education levels, had to swiftly adapt to the "new normal" of online teaching and facilitation sessions. The paradigm shift towards virtual learning has not been exclusive to specific courses or student demographics. Even technical students, particularly those enrolled in universities and Technical and Vocational Education and Training (TVET) institutions, have embraced online learning technologies to ensure the continuity of their education amidst the challenging circumstances (International Labour Office, 2021).

In this context, the importance of technical skills has become increasingly apparent. The technologies facilitating online education and remote work are a testament to the contributions of experts possessing technical skills in their respective fields. The demand for these technical skills has risen significantly, underscoring their crucial role in navigating the current industrial landscape, especially in rapidly developing nations like Germany, where over 50% of the local labour force is highly skilled (Eva and Thomas,2017). The existence of a highly competent technical workforce is emblematic of a country's development speed, reflecting the symbiotic relationship between technical education and industrial progress. Despite the challenges imposed by the pandemic, the necessity of continuing technical education persists, ensuring that students acquire the practical, industry-specific skills demanded by the evolving job market.

As a result, technical education serves not only as a means of addressing immediate challenges but also as a constant and integral component of a nation's growth and resilience. The adaptability and contributions of technical experts play a vital role in shaping the trajectory of industries and economies, making technical skills a cornerstone for progress in the face of unprecedented global challenges. Thus, this paper was identifying the mastery level of technical skills and suitability of teaching and learning method among Technical and Vocational Education students during the Covid-19 period.

Research Background

Technical education students have faced a setback in their learning, particularly in terms of hands-on technical and practical training, as a consequence of inadequate facilities in their residential settings during the onset of the Covid-19 pandemic. This discrepancy arises because

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technical students, as highlighted by Yeap et al. (2021), inherently require more than just online learning; they necessitate immersive hands-on training. To ensure a consistent production of skilled labor in Malaysia, it is imperative to address the challenges faced by technical students in accessing proper training facilities.

In the face of these challenges, it is evident in certain situations that the crisis presents a chance to create more adaptable learning solutions, optimizing the use of distance learning and digital tools. Nevertheless, the transition to online or distance learning in TVET and skills development amid the pandemic should be viewed primarily as an emergency measure rather than a swift and enduring shift in program delivery. While short-term solutions have been identified and implemented, it is crucial to leverage this opportunity for generating enduring positive effects and fostering increased resilience in education systems (Paul, 2020)

The Covid-19 pandemic has disrupted the normal daily routines of communities globally, impacting students studying in various institutions, and technical education has not been exempting from these challenges. The enforcement of the Movement Control Order on March 18, 2020, compelled educational institutions to suspend face-to-face classes, affecting students and lecturers alike. This shift posed a significant challenge for students enrolled in technical skills courses, as they encountered a critical impediment: the inability to practice and apply the skills they had been learning.

According to Paul (2020), skills are knowledge gained and applied through hands-on activities, which ultimately trigger minds-on thinking. Thus, the Covid-19 pandemic has presented significant challenges for technical students in honing their technical skills in their respective fields. Before the Covid-19 pandemic, students could clearly learn and experience hands-on activities, allowing them to physically interact with machines or tools. This hands-on experience led to a higher level of proficiency in operating equipment, machines, or performing tasks. Additionally, students' retention of knowledge was better when they practiced tasks in a tangible way. However, the Covid-19 pandemic has hindered students from practicing their learned skills. The lack of access to necessary equipment for practical work has prevented students from applying their skills, which could affect their proficiency in technical skills. According to Bakri and Zakaria (2018), having sufficient and well-functioning equipment is crucial for mastering technical skills. Almost all practical learning activities were postponed to prevent the spread of the virus, and only a few practical courses, such as those in electronics, could be appropriately conducted online.

The distinctive nature of technical learning, which heavily emphasizes hands-on training, sets it apart from theoretical instruction. As underscored by Yeap et al. (2021), technical skills are best acquired and refined through practical application, either through demonstrations by instructors or through self-directed learning. A crucial aspect highlighted in the Skills Development in the time of Covid-19 report (2021) is the limitation of distance learning alternatives in replacing the quality of face-to-face classes. This observation is particularly pertinent for TVET students, whose education revolves around work-based learning and the acquisition of practical skills. In light of these challenges, it becomes imperative to not only recognize the constraints faced by technical education students during the pandemic but also to implement strategies that enable them to access hands-on training facilities. The holistic development of technical skills relies on a balanced approach that incorporates both theoretical knowledge and practical application, ensuring that technical students are adequately prepared

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for the demands of their future careers in a dynamic and competitive job market. Therefore, a study on technical skills was conducted to assess the level of technical skill proficiency among TVET students at UTM during the Covid-19 pandemic. Additionally, this study aimed to identify suitable teaching and learning methods for practical skills to be used during the pandemic.

Objectives

I. Identify the level of technical skills among Technical and Vocational Education students during the Covid-19 period.
II. Identify suitability of the teaching and learning methods used to master technical skills during the Covid-19 period.

Methodology

To achieve the objectives of this study, non-experimental methods were used to identify the mastery level of technical skills of TVET students as well as the teaching and learning methods used to master technical skills during the Covid-19 period. A quantitative study survey in the format of a questionnaire was conducted using a 4-point Likert scale through the Google form, which was distributed to TVET students in year 4. The population of this study is 106 respondents. According to Krejcie and Morgan's table (1970), the required sample size is 86 respondents. The respondents consisted of students from 4 TVET courses, namely Bachelor of Technology with Education (Electrical and Electronics), Bachelor of Technology with Education (Building Construction), Bachelor of Technology with Education (Mechanical Engineering), and Bachelor of Technology with Education (Life Skills).

Before distributing the questionnaire to the 86 sample respondents, a pilot study was first conducted by the researcher. A pilot study was conducted to determine the appropriateness of the questionnaire used. A total of 10 students were selected for the said trial run. The number of respondents selected is reasonable. This is because the sample size to carry out a pilot study does not need to be large; 6 to 9 respondents are sufficient to fulfil the purpose of an effective initial discussion (Najib,1999). After the pilot study, data collected were analysed; the resulting Cronbach's alpha value is 0.79, which means the instrument is at a high level of reliability. The question items used are appropriate for the study. This is because, when the value of Cronbach's alpha coefficient equals to more than 0.60, then the measuring tool is good and suitable for use (Idham et al,2010).

Finding

A 4-point Likert scale quantitative research method was used in this study. Table 1 shows the frequency value, percentage, min standard deviation and mean level. The values were calculated using the Statistical Package Social Sciences (SPSS) software version 26.0, which are used to find out the items the students agreed with or otherwise.

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Table 1. Distribution of Respondents by Mastery Level of Technical Skills During Covid-19

No	Item	STS	TS	S	SS	Min (SD)	Mean
		F(%)	F(%)	F(%)	F(%)		
1	I can do practical work referring to the guidance given.	1 (1.2)	1 (1.2)	40 (46.5)	44 (51.2)	3.48 (0.589)	Moderate
2	I can practise by referring to the given demonstration.	-	2 (2.3)	35 (40.7)	49 (57.0)	3.55 (0.546)	Moderate
3	I can use hand tools/ machines based on the practical work carried out.	2 (2.3)	1 (1.2)	48 (55.8)	35 (40.7)	3.35 (0.628)	Moderate
4	I can use hand tools/ machines based on the guidance given.	2 (2.3)	2 (2.3)	45 (52.3)	37 (43.0)	3.36 (0.649)	Moderate
5	I can use measurement instruments based on the practical work done.	-	3 (3.5)	50 (58.1)	33 (38.4)	3.35 (0.548)	Moderate
6	I can read the scale of an analogue measuring instrument.	1 (1.2)	2 (2.3)	53 (61.6)	30 (34.9)	3.30 (0.575)	Moderate
7	I can write a report based on the practice that has been carried out.	1 (1.2)	1 (1.2)	33 (38.4)	51 (59.3)	3.56 (0.586)	Moderate
8	I can explain the practical procedures well in the report.	1 (1.2)	1 (1.2)	41 (47.7)	43 (50.0)	3.47 (0.588)	Moderate

As a result of the analysis of technical skill mastery items, the objective of this first study recorded an average mean value of 3.30, which is at a moderate level. The set level is based on Table 5.1 the mastery of core abilities scale in the previous chapter. All the first objective items recorded a moderate mean level. 1 of the 8 analysed items recorded a mean value that approaches the high level, which is item 7 (I can write a report based on the practice that has been carried out) where the mean value of item 7 is 3.56. Besides, 2 of the 8 items recorded the same mean value of 3.35 on item 3 (I can use hand tools/machines based on the practical work carried out), and item 5 (I can use measurement instruments based on the practical work done).

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Table 2. Distribution of Respondents according to Teaching and Learning Methods During the Covid-19 Period

No	Item	STS	TS	S	SS	Min
		F(%)	F(%)	F(%)	F(%)	(SD)
	I can master technical skills through the methods mentioned below:-					
1	Demonstration of a live model (the real model is used to perform the demonstration)	1 (1.2)	2 (2.3)	44 (51.2)	39 (45.3)	3.41 (0.602)
2	Demonstration of a symbolic model (demonstration based on steps in writing, pictures or teacher's lecture)	-	4 (4.7)	50 (58.1)	32 (37.2)	3.33 (0.562)
3	Demonstration of perception model (use of video to show demonstration)	-	1 (1.2)	50 (58.1)	35 (40.7)	3.40 (0.515)
4	Group discussion	-	1 (1.2)	50 (58.1)	35 (40.7)	3.40 (0.587)
5	Discussion in pairs	1 (1.2)	3 (3.5)	53 (61.6)	29 (33.7)	3.28 (0.587)
6	Video sharing from the YouTube application	-	5 (5.8)	43 (50.0)	38 (44.2)	3.38 (0.597)
7	Online video sharing by lecturers	1 (1.2)	4 (5.8)	43 (50.0)	37 (43.0)	3.35 (0.647)
8	Mastery based on question and answer	-	7 (8.1)	51 (59.3)	28 (32.6)	3.24 (0.593)
9	Project-based mastery	1 (1.2)	7 (8.1)	56 (65.1)	22 (25.6)	3.15 (0.604)
10	Problem-based mastery	1 (1.2)	7 (8.1)	56 (65.1)	22 (25.6)	3.15 (0.604)
11	Mastery based on lecturers' lectures	2 (2.3)	9 (10.5)	54 (62.8)	21 (24.4)	3.09 (0.662)

Table 2 shows respondents' data for the second objective, which is related to teaching and learning methods (T&L) during the Covid-19 period. The research data for the second objective starts from item 1 to item 11. Item 1 which is the method of demonstrating the life model in T&L recorded a frequency of 44 times (51.2%) for the "agree" scale. Next, for items 2, 3 and 4, which are the symbolic model demonstration method, the perception model demonstration method and the discussion method in the group, each recorded the highest frequency of 50 times (58.1%). While for item 5, which is the method of discussion in pairs, the highest frequency for the "agree" scale is 53 times (61.6%), followed by the "most agree" scale 29 times, the "disagree" scale 3 times, and the frequency of the "least agree" scale 1 time. Then, items 6 (the method of sharing videos from the YouTube application) and 7 (the method of online video sharing by lecturers) recorded the same frequency, where each recorded a frequency of 43 times (50.0%) for the "agree" scale. Items 6 and 7 also recorded the same frequency for the "disagree" scale, which is 5 times (5.8%). Next, for item 8, the highest frequency is on the "agree" scale, which is 51 times (59.3%). The highest frequency falls on the "agree" scale, which is 45 times (52.3) for item 9 (project-based mastery) and 56 times

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(65.1%) for item 10 (problem-based mastery). However, there is a similarity in items 8, 9 and item 10 for the frequency for the "disagree" scale, which is 7 times (8.1%). Finally, for item 11, which is the mastery method based on the lecturer's lectures, the highest frequency falls on the "agree" scale, which is 54 times (62.8%); followed by the "strongly agree" scale, which is 21 times (24.4%); the "disagree" scale 9 times (10.5%); and the "strongly disagree" scale, which is 2 times (2.3%).

Discussion

Mastery Level of Technical Skills of TVET Students

Based on the analysis results obtained through the computation of questionnaire data using the SPSS version 26.0 software, the mastery level of technical skills of TVET students during the Covid-19 period is at a moderate level. This is because, when the Covid-19 pandemic broke out, the TVET students could not continue their studies because their studies depended on physical learning. This can be proven through previous studies which state that the TVET curriculum becomes a big challenge if the TVET learning mode is changed to online, because TVET learning is more focused on technical skills and willingness to work (Yeap et al,2021). Therefore, TVET stream students are the most affected lot because they cannot practise their technical skills.

The lack of equipment, needed for practical training, is also one of the reasons why the mastery level of technical skills of TVET students is low. Hand tools or machines are the most important apparatus in practising technical skills. This is because, through using the equipment or machine, students know how to operate it and know which skills require the use of certain equipment/machine. The use of equipment and hand tools is very important when carrying out practical work because it shapes the students into highly skilled individuals as desired by the government of Malaysia (Chang,2018). However, when the Covid-19 pandemic occurred, students were confined to their respective residences. The equipment or machines needed at each place of residence are limited or nothing at all. Under such circumstances, students were unable to practise their skills and were only able to learn theoretical knowledge.

Due to the students' inability to undergo technical skills training, the process of documenting the work path or practical report is adversely affected. When students do not carry out practical training, they cannot clearly imagine the procedures involved in an operating exercise. Therefore, the written report cannot be done well. A good report is very important; it is easier for a person to remember the process that has been carried out; it is also easier for the next user to understand what process is involved through the written report. Report writing activities can also refresh and reinforce the memory of the student's mind. Writing or noting something helps increase a person's memory capacity to remember and memorize information (Aloraini,2012) Therefore, the mastery level for items involving the production of reports is also at a moderate level.

Teaching And Learning Methods During The Covid-19 Period

The analysis results of the second question, which is whether the teaching method used is suitable to overcome technical skills when Covid-19 occurred, is at a moderate level. This is because, not all learning methods are suitable for training students' technical skills. Based on the 11 items studied in the questionnaire, item 3 (demonstration of the perception model) and 4 (discussion in the group) have the highest mean value, which is 3.40 respectively. Based on

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the mean value obtained, learning is more effective when teaching and learning is carried out using the perception model demonstration method, and the group discussion method.

The demonstration of the perception model (the use of video to show the demonstration) is more interesting because the steps of using a tool or carrying out a practice are more thorough and clearer compared to the demonstration of other models. This is because video clips help communicate teaching information more clearly and accurately (Aloraini,2012) In addition, the use of videos is more interesting to students as most videos have interesting visuals and it is easier for students to understand the concepts. Based on previous research, the use of videos in teaching is able to attract students' interest, as well as raising the motivation level and enriching learning experience (Jamalludin dan Zaidatun, 2003).

The use of video in T&L can improve the quality of students' work in addition, by using videos, it is more convenient for students to access the information of technical skills they need at any time. Moreover, during the Covid-19 pandemic, students are more focused and are only able to learn through online method (Jamil dan Ilinadia, 2021).

The group discussion method is also suitable for teaching and learning during the Covid-19 period; it is easy to access. Discussion activities stimulate students' thinking process, critically and creatively, as they have to express their ideas and opinions on the issues raised (Norhasni and Azahari, 2016). Besides, participation in discussions increases students' theoretical understanding in a deeper manner. When students clearly grasp the theory behind a skill being discussed, they can confidently apply that skill when carrying out practical tasks in the workshop. A theoretical understanding of a piece of work is also very important, which will enable a student to undertake the practical work process correctly and in compliance with the pre-set procedures.

Conclusion

Overall, the mastery level of technical skills needs to be taken seriously, because these skills are very much sought after in the industrial sector. The outbreak of Covid-19 has a far-reaching impact on technical skills training, due to the constraints of carrying out the practical training using tools and machineries in the workshop. The teaching and learning methods used previously had to be modified such that students could continue with their learning effectively. The advent of modern information and communication technology now provides some convenience for technical students to continue learning despite all the physical constraints brought by the pandemic. However, the mastery level of technical skills is at a moderate level based on the mean value obtained from the study results. Although the respondents are made up of 4th year semester II students who possess much experience in technical subjects, the mastery level of their skills is still at a moderate level. This implies that there is room for teaching and learning methods to be further improved. It just goes to show the profound ramifications of the Covid-19 outbreak, which has also negatively impacted the skill mastery of TVET students.

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