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Teacher Readiness for Digital Competence in TVET Education at Vocational Colleges

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Abstract

This study aims to identify the level of skills, knowledge and attitudes of technical instructors towards their readiness in mastering the competencies of the digitization system in TVET education with a focus on four Vocational Colleges namely Muar Vocational College, Kluang Vocational College, Batu Pahat Vocational College and Segamat Vocational College. The study uses a quantitative approach through data collection using a questionnaire involving 145 respondents from among technical instructors at the Vocational College involved. The results of the study found that the knowledge of technical instructors is at a moderate to high level, where they understand the basic concepts of digitization systems but lack exposure to advanced technology and more complex digital applications. The skill level was found to be at a moderate level with most teaching staff showing basic ability in using digital technology such as online learning software, but facing difficulties in handling more technical and specific software. In terms of attitude, the majority of teaching staff showed openness and a positive attitude towards the use of technology with a willingness to learn and integrate digitization systems in their teaching. However, this study also identified some challenges faced by teaching staff including time constraints to learn new technology, lack of ongoing technology training as well as limited access to facilities and digital equipment in the Vocational Colleges involved. This study also confirmed that there is a significant relationship between knowledge, skills and attitudes where an increase in one of these elements can strengthen the other elements. Therefore, this study emphasizes the need to comprehensively improve technology training, increase access to digital infrastructure, and provide continuous support to strengthen the readiness of technical teaching staff to face the challenges of digitization in TVET education. The results of this study provide important guidance to the management of Vocational Colleges to formulate a more comprehensive and effective strategy in improving the digital competence of teaching staff in line with the increasingly digital and high-tech TVET education needs. The readiness of teaching staff towards digitization in TVET education in Vocational Colleges is positive, but still needs to be

strengthened with continuous training and adequate infrastructure. Support from institutions, industry and government is very important to ensure this transformation is successful. With a holistic approach, digitization can improve the quality of teaching and prepare teachers and students to face the technological challenges of the future.

1. Introduction

In this era of globalization, digitalization in the education system is not something new, but is accepted by all levels of education from kindergarten to higher education institutions. This is aimed at transforming the education system in Malaysia to form creative and innovative teachers and students in line with global needs in realizing the Industrial Revolution 4.0. In addition, digitalization is also important for the Ministry of Education Malaysia (KPM), Vocational College Institutions (KV) and teachers to be in line with this increasingly technological era. According to Haslin et al., (2024), the government's efforts in empowering the digital economy to implement digital education policies are the government's steps in preparing a digitally competent generation which can improve the quality of education in the country and the world.

In 2014, the Ministry of Education Malaysia (KPM) implemented Information and Communication Technology (ICT)-based learning, where training and courses were provided to teachers to control computer power and related applications. The use of the internet and technology will also improve students' talents in dealing with computers and networks, and students will be able to communicate with other students regardless of national borders to improve their communication skills (Nordin & Alias, 2023). However, the challenges that teachers need to address in facing digital education still need attention (Abdullah et al., 2021). Lack of digital infrastructure facilities, lack of skills in operating computer applications, and obstacles to accessing the internet by students with low readiness are among the challenges faced by teachers.

Rujira et al., (2020) said that digital technology is an important factor for organizational modernization and to support this rapid change. By using digital as part of digital transformation to change traditional work systems to more technology to provide new business models, modern processes and create excellent products and services. The Technical and Vocational Training Education Division (BPLTV) under the Ministry of Education Malaysia, which is an educational organization operating in the production and development of human resources to meet the needs of manpower in the development of the country, considers it a necessity to transform into an organization in the digital era, namely a high-performance organization so that the organization can produce a quality workforce and standards in line with economic and social development.

The purpose of establishing Vocational Colleges is to produce more graduates with high skills in line with current technological developments to meet the needs of the industry. The teaching and learning system at Vocational Colleges is also based on two categories, namely skills of 70% and academics of 30%. Ishak & Talaat (2020) stated that the TVET program is an integration between the theoretical and practical learning process. Therefore, thorough preparation by teachers in terms of knowledge, skills and attitudes on the digitalization system towards digital competencies is very important so that the teaching and learning process related to theory and practice can be delivered correctly, smoothly and effectively to students in accordance with the goals and objectives of teaching. Therefore, this study was conducted to identify the readiness of technical teachers towards the use of digitalization systems in TVET education at Vocational Colleges based on three measured characteristics, namely the knowledge, skills and attitudes of teachers in implementing digitalization-based teaching at Vocational Colleges.

2. Methodology

In this study methodology, the aim is to achieve the objectives stated in chapter 1. Methodology is a method or way to determine how the study was conducted to obtain the results of the study. The study methodology must be systematic and organized so that researchers can easily understand the study conducted to obtain the correct study data. Therefore, this chapter will reveal the methods used throughout this study to obtain quality and useful study results. The aspects prioritized in this chapter are the study design, sampling strategy, data collection methods, instruments used and procedures followed to ensure the validity and reliability of the research. It also aims to reveal the approach and design chosen, as well as important components to strengthen the study in the research.

2.1 Validity and Realibility

Both validity and reliability are important in ensuring the quality and accuracy of data collected in research. Validity ensures that the measuring instrument measures what it is intended to measure, while reliability ensures that the measuring instrument provides consistent and stable results (Prabhavathy at al., 2024). This shows that validity and reliability are important to achieve research objectives accurately and be able to generalize to the target population. With this, relevant and reliable results stem from accurate research instruments.

There are several steps that need to be taken to ensure the validity of the study. A thorough review by experts and experts in digital systems is required in the questionnaire to establish content validity. Their review and feedback can ensure that the questionnaire can be used and is appropriate for the study objectives. Next, the questionnaire will be tested by conducting a pilot test on a small number of teachers to assess their understanding of the questions given. Indirectly, this step informs the use of the correct instrument to measure what is supposed to be measured and helps in identifying parallelism in the questionnaire items.

Internal reliability will be assessed using Cronbach's alpha coefficient, a widely recognized statistical measure for measuring the reliability of a questionnaire (Pallant, 2020). Cronbach's alpha coefficient will be used in this study to provide an idea of the reliability of the instrument. A satisfactory alpha coefficient value is above 0.7 and indicates good reliability. However, if the value is too low, it may require the elimination of inconsistent items in the questionnaire (George & Mallery, 2010). Table 2.1 shows the alpha coefficient grades. A Cronbach's alpha coefficient above 0.7 is acceptable.

Tablel 2.1 Range of Validity and Reliability
(George & Mallery, 2010)

Cronbach's alpha coefficient	Level of Reliability
More than 0.90	Excellent
0.80 – 0.89	Good
0.70 – 0.79	Accepted
0.60 – 0.69	Questioned
0.50 – 0.59	Weak
Less than 0.59	Not acceptable

In this study, to ensure the validity and reliability of the research instrument is important to produce reliable results, the readiness of technical teaching staff at Vocational Colleges is a complex and very important in selecting the right research instrument in this study. With the existence of validity and reliability in the study, it can expand the researcher's motivation towards the findings and ensure that the results can be focused on the target population.

2.2 Pilot test

A pilot study is an initial study conducted on a small scale before the main study is conducted. This aims to assess the effectiveness of the instrument that will be used in the main study. This pilot study assists researchers in obtaining data collection and making the necessary adjustments before the full study is conducted (Bougie & Sekaran, 2019). Therefore, a sample size of 30 teachers will be used to ensure the accuracy and reliability of the study findings. The results of this study have found that teachers have a better understanding of the elements that are important for the readiness of technical teachers towards the competence of the digitalization system in Vocational Colleges, especially in the southern zone of Johor.

The results of this pilot study will create a solid foundation for further research in this field. Therefore, stakeholders can identify in more depth the elements that influence the digitalization system among teaching

staff in Vocational Colleges and ultimately be able to plan more effective strategies to expand support and effectiveness in implementing the digitalization system. Stratified random sampling techniques were used to ensure more accurate representation of respondents. The questionnaires filled out by the respondents were analyzed using IBM SPSS statistics. The reliability of the questionnaires contained in Section B, Section C and Section D was carefully assessed. The reliability statistics for these sections are shown in Table 3.6 which illustrates the level of validity of the data collected and allows for a more in-depth analysis of the elements that influence the readiness of teaching staff towards digitalization competencies in TVET education in Vocational Colleges.

Table 2.2 Reliability Statistics of Questionnaires Part B, Part C and Part D

Reliability Statistics		
Section	Cronbach's alpha	Number of Items
Section B (Knowledge Level)	0.987	20
Section C (Skill Level)	0.989	20
Section D (Attitude Level)	0.994	20

Based on Table 2.2, this study has assessed the reliability of the questionnaire instrument to measure the readiness of teachers towards digitalization competence in TVET education at Vocational Colleges. Cronbach's Alpha statistic was used to determine the level of reliability of each section of the questionnaire, where a high value indicates very good internal consistency. This study measures three main aspects, namely the level of knowledge (Cronbach's Alpha: 0.987) which assesses the teachers' understanding of the concepts, theories and applications of digitalization technology in TVET education. Next is the level of skills (Cronbach's Alpha: 0.989), which examines the ability of teachers to use and apply digital technology in the teaching and learning process, and the level of attitude (Cronbach's Alpha: 0.994), which assesses the readiness, acceptance and interest of teachers towards the use of digital technology in education. With a Cronbach's Alpha value exceeding 0.7 for all sections, this indicates that the questionnaire instrument used has a very high level of reliability, making it suitable for use in real studies to obtain more accurate and reliable findings.

3. Findings

Data analysis and study findings obtained from a questionnaire conducted on technical instructors at Muar Vocational College, Segamat Vocational College, Batu Pahat Vocational College and Kluang Vocational College. This analysis was conducted to achieve the study objective, which is to identify the level of knowledge, skills and attitudes based on the respondents' perceptions. In addition, this chapter will also analyze the relationship between the three elements in the readiness of instructors towards digitalization competencies in TVET education at Vocational Colleges. The data obtained were analyzed using descriptive and inferential statistical methods such as mean, standard deviation and correlation analysis. The study findings will be summarized to provide an overview of the elements that influence the readiness of technical instructors at Vocational Colleges towards the use of digitalization systems.

This study aims to understand the relationship between the knowledge, skills and attitudes of teachers in the context of their readiness for digital competence in TVET education at Vocational Colleges. Knowledge refers to the level of teachers' understanding of the concepts and applications of educational technology and the extent to which they follow the latest developments in the field of digital technology. This knowledge is important because it allows teachers to more easily adapt to digital tools and applications used in teaching and learning. Without sufficient knowledge, the use of technology in teaching cannot be implemented effectively.

Skills are related to the ability of teachers to use and integrate digital technology in their teaching process. This involves not only mastery of technological tools but also the ability to use them in a way that facilitates student understanding and improves learning outcomes. Meanwhile, attitudes play an important role in determining the level of acceptance and openness of teachers to the use of digital technology. A positive and proactive attitude towards technology increases their likelihood of engaging in professional training and improving their technical skills. The combination of these three elements, namely knowledge, skills and

attitudes, greatly influences the readiness of teachers to effectively implement digitalization systems in TVET education, which can ultimately improve the quality of teaching and learning in Vocational Colleges.

3.1 Analysis of the Relationship Between Knowledge and Skills from Teachers' Perceptions of Digitalization Competencies in TVET Education at Vocational Colleges

This analysis examines the relationship between the knowledge and skills of teachers at Vocational Colleges in applying digitalization in TVET education. The findings show that these two elements are closely related, where in-depth knowledge of educational technology is the basis for teachers in mastering the skills of using technology in teaching. Spearman correlation analysis was used to measure the strength and direction of the relationship between these two elements, because it is suitable for ordinal and non-normally distributed data. The results of the study show that a strong positive correlation between knowledge and skills indicates that teachers who are more knowledgeable tend to be more skilled in using technology. On the other hand, if the relationship between these elements is weak, it indicates the need for additional training that is more focused on improving knowledge and skills simultaneously. Therefore, the results of this analysis can be the basis for planning more effective training programs to improve the readiness of teachers in digitalization at Vocational Colleges.

Tablel 3.1 Spearman Correlation Value and Significance for the Relationship Between Knowledge and Skills from Teachers' Perceptions in Readiness for Digitalization Competencies in TVET Education at Vocational Colleges

The Relationship Between Knowledge and Skills			
		Knowledge	Skill
Knowledge	Spearman's Correlation (ρ)	1	0.795**
	Significant (p)		<0.001
	Numbers	145	145

Spearman correlation analysis in Table 3.1 shows a very strong and significant relationship between the knowledge and skills of technical instructors in TVET education at Vocational Colleges, with a value of $\rho = 0.795$ and $p < 0.001$. This proves that the improvement of instructors' knowledge of digital educational technology is closely related to the improvement of their skills in using it in teaching. This result emphasizes that efforts to improve the knowledge of digitalization technology through training and professional development will strengthen the skills of instructors and increase their teaching effectiveness. In addition, this study confirms that the readiness of instructors towards technology does not only depend on their attitude but also on the level of knowledge they possess, which directly affects their competence in digitalization. In conclusion, improving the knowledge of instructors is an important step to strengthen digital skills, as well as ensuring their readiness in implementing the digitalization system in TVET education.

3.2 Analysis of the Relationship Between Knowledge and Attitudes from the Perception of Teaching Staff towards Digitalization Competencies in TVET Education at Vocational Colleges

This analysis examines the relationship between teachers' knowledge and attitudes in readiness for digitalization competencies in TVET education at Vocational Colleges. The findings show that these two elements are closely related, where high knowledge about digitalization provides teachers with a strong foundation to apply technology in teaching, while a positive attitude encourages them to continue learning and adapt to technological changes. Teachers who are open and proactive are more likely to develop and apply their knowledge effectively. Spearman correlation analysis, as shown in Table 4.10, confirms this relationship and emphasizes the importance of not only increasing technical knowledge, but also forming positive attitudes through training that builds confidence in the use of technology. This result is important in improving the quality of teaching, strengthening teachers' attitudes, and contributing to more active student engagement in TVET learning.

Table 3.2 Spearman Correlation Value and Significance for the Relationship Between Knowledge and Attitude from the Perception of Teaching Staff in Readiness towards Digitalization Competencies in TVET Education at Vocational Colleges

The Relationship Between Knowledge and Attitude			
		Knowledge	Attitude
Knowledge	Spearman's Correlation (ρ)	1	0.703**
	Significant (p)		<0.001
	Items	145	145

Spearman correlation analysis in Table 3.2 shows a strong and significant relationship between teachers' knowledge and attitudes towards digitalization in TVET education, with a value of $\rho = 0.703$ and $p < 0.001$. This proves that the higher the teachers' knowledge of educational technology, the more positive their attitude towards its use in teaching. In-depth knowledge increases teachers' confidence and readiness in adapting technology, thus encouraging them to be more open to continuous learning and digital innovation. The value of $p < 0.001$ shows that this relationship is real and reliable, emphasizing that increased knowledge directly contributes to a more proactive attitude in the use of technology. Therefore, TVET educational institutions need to emphasize continuous training in digitalization technology to ensure that teachers are more prepared, confident, and able to apply technology effectively in the classroom, which in turn improves the quality of teaching and the effectiveness of TVET education.

3.2 Analysis of the Relationship Between Skills and Attitudes from Teachers' Perceptions of Digitalization Competencies in TVET Education at Vocational Colleges

Spearman correlation analysis in Table 3.3 shows a significant and positive relationship between teachers' skills and attitudes towards the digitalization system in TVET education at Vocational Colleges. Teachers who are more skilled in the use of digital technology tend to have a more positive attitude towards the application of technology in teaching. This relationship emphasizes the importance of practical training and continuing education, where improving skills not only improves the technical competence of teachers but also encourages them to adapt technology more proactively and effectively. Therefore, to ensure that teachers are better prepared to face changes in digital education, it is important to provide quality technology skills training and build a positive attitude towards digitalization. This will ensure that they can meet the needs of TVET education that are in line with current technological developments.

Table 3.3 Spearman Correlation Value and Significance for the Relationship Between Skills and Attitudes from Teachers' Perceptions in Readiness towards Digitalization Competencies in TVET Education at Vocational Colleges

Relationship Between Skills and Attitudes			
		Skills	Attitudes
Skills	Spearman's Correlation (ρ)	1	0.652**
	Significant (p)		<0.001
	Items	145	145

Spearman correlation analysis in Table 3.3 shows a positive and significant relationship between teachers' skills and attitudes towards digitalization systems in TVET education, with a value of $\rho = 0.652$ and $p < 0.001$. This indicates that the higher the teachers' skills in using digital technology, the more positive their attitudes towards its use in teaching. Teachers with more skills tend to be more confident, proactive, and see technology as a tool that facilitates teaching. On the other hand, teachers with low skills may be less confident and have more difficulty accepting technology. The p value < 0.001 confirms that this relationship is real and reliable, emphasizing that skills in digital technology are a key factor in shaping teachers' positive attitudes. Therefore, quality skills training and continuous development are important to ensure that teachers are more prepared and confident in applying technology in TVET education, which in turn increases the effectiveness of digital teaching and learning.

4. Discussion

This discussion includes an in-depth analysis of the study findings and how the results of this study answer the objectives that have been set, especially regarding the readiness of teachers to master digitalization competencies in Vocational Colleges. This analysis focuses on the aspects of knowledge, skills and attitudes, by examining in detail how each of these elements plays a role in shaping the level of readiness of teachers to use digitalization technology in the teaching and learning process. As mentioned by Nordin & Alias, (2023), the use of the internet and technology will also improve students' talents in dealing with computers and networks, and students will be able to communicate with other students regardless of national borders to improve their communication skills. All these students' talent opportunately contributed by the aspects of knowledge, skills and pedagogical techniques of teachers. However, there are many challenges have to faced by teachers and they sholud have confidence, technical skills in applying technology improve teaching efficiency and positive attitudes towards technology encourage them to continue learning and adapt to technological changes. This findings quite similar with the thought of Abdullah et al., (2021).

In addition, from the findings, it can be discussed also that the lack of digital infrastructure facilities, lack of skills in operating computer applications, and obstacles to accessing the internet by students with low readiness are among the challenges faced by teachers. Conversely, a lack of knowledge or skills can be a barrier to their readiness, thereby affecting their ability to meet the increasingly technology-oriented needs of TVET education. This section also examines the main challenges faced by teachers such as difficulty in mastering the latest technology, time constraints to learn new digital applications and lack of technical support and ongoing training. This analysis provides a clear picture of the factors that help or hinder teachers' readiness to use digitalization systems.

In this context, the discussion also focuses on the relationship between knowledge, skills and attitudes by examining how these elements complement each other in supporting teacher readiness. In-depth knowledge of digitalization technologies not only improves teachers' skills in using technology but also builds a positive attitude towards the need to digitize teaching. By understanding the relationship and role of each of these elements, this discussion also provides a solid basis for proposing practical steps that can be taken to improve the competence of educators. These suggestions are not only intended to overcome the identified challenges but also to ensure that educators are better prepared to face the demands of technology that are rapidly evolving in line with the needs of modern industries.

5. Conclusion

This study discusses the level of readiness of teachers at Vocational Colleges towards the use of digitalization technology in TVET education as a whole. In terms of knowledge, teachers demonstrate good mastery of basic technologies such as digital learning platforms and online software, especially for those who are experienced or have undergone technology training courses. However, there is a lack of mastery of advanced technologies such as virtual reality (VR), augmented reality (AR) and industrial simulation software, which indicates the need for efforts to expand their knowledge in this area. Teachers' skills in the use of basic technologies are also sufficient, but mastery of advanced technologies relevant to vocational needs such as technical design software (CAD), is still not widespread. Therefore, more specific and comprehensive intensive training is needed to ensure that teachers are able to master more complex technologies.

In addition, the attitude of teachers towards digitalization is positive with most of them showing a willingness to learn and adapt technology in their teaching. However, concerns remain especially among teachers who are less experienced or have less exposure to the latest technology which is usually due to lack of training and technical support. The relationship between the elements of knowledge, skills and attitudes is also clear, where increased knowledge contributes to better skills and both help strengthen positive attitudes towards technology. To address this challenge, the document recommends a holistic training approach that includes elements of theory, practical practice and the formation of positive attitudes. This training needs to be accompanied by ongoing guidance and support to ensure that teachers are prepared to face rapid technological changes while meeting the needs of Vocational Colleges and modern industries.

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Conflict of Interesr

I would like to confirm that there is no conflict of interest in the publication of this study. The authors have no personal or financial interests that would influence the results of this study.

Author Contribution

The author emphasizes that this study was conducted using valid methodology. Based on the analysis that has been done through several articles, the author was also involved in the writing and editing process to ensure a clearer, consistent and relevant writing style for this study.

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