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Technology Integration among Teachers: The Role of Principal's Technology Leadership Practices

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***Abstract*:**This study aims to identify the relationship between technology leadership practices among principals and the technology integration among teachers. It was quantitative study involving 492 teachers fromPeninsular Malaysia. Descriptive analysis shows that the principal's technology leadership and the technology integration among teachers at school are performed at anextremely high level. The MANOVA analysis shows that there is no significant difference for the technology leadership practices based on the experience of being a principal, but there is a significant difference based on the number of ICT courses attended. While the structural model test reveals that there is a significant relationship between the principal's technology leadership practices and the technology integration among teachers ($\beta = 0.413$; $t = 5.761$). The standard coefficient value shows that all dimensions in the technology leadership construct are predictive factors for encouraging the technology integration among teachersin schools where the dimension of visionary planning is the dominant predictor and makes a positive contribution of 93.2%. The findings of the study can provide input to those responsible for providing training in preparing various initiatives to help principals improve the level of technology leadership.

Keywords:*Technology Leadership, Technology Integration, Demographic.*

1. Introduction

The qualities of teaching and learning now are substantially different from previous education. The goal of education in the 21st century is to produce students who have various skills including in the purpose of communicating and high-level information and communication technology (ICT) thinking. In addition, when the whole world is shaken by the Covid-19 pandemic that has involved various sectors including education, the use of ICT has become the most beneficial medium for learning purposes. ICT is seen not only to teach students about a subject but at the same time it provides an opportunity to observe how they learn, the types of tasks that interest them and the problems they find boring.

The main drivers for student success in schools are teachers and principals (KPM, 2013). School leaders are not just leading administrative tasks, but even serve as instructional leaders, whose primary responsibility is to raise quality of teaching and learning in their respective schools.Meanwhile, teachers need to first equip themselves with all these skills to teach more effectively. Teachers constantly be prepared to improve themselves and change their teaching approach in line with the development of technology and current career needs (Nor Amalina&Zanaton, 2018).

Technology leadership is a combination of strategies and techniques that are common to leadership but with an emphasis on technology, especially related to access to equipment, technology improvements and the awareness that professional development and the technology integration are constantly changing in line with the passage of time and eras (Tisebio & Roslee, 2020). Organizational technology integration includes the overall frequency and pattern of technology use, the development of a teaching technology environment and the implementation of technology applications (Texas Education Agency, 2010). Meanwhile the use of technology by teachers to introduce, reinforce, expand, enrich, evaluate, and restore student knowledge of curriculum objectives is known as technology integration. (Hamilton, 2015).

Previous studies have shown that principals' knowledge and skills in the use of ICT still fall short of the standard as suggested by the National Educational Technology Standards for Administrators or NETS-A(Osman, 2014; Banoglu et al., 2016; Ozkan et al., 2017). This phenomenon shows that the principal's technology leadership level is still low and unsatisfactory performance (Kor et.al, 2016; Uğur & Koç, 2019). The literature analysis also reveals that the majority of school leaders in Malaysia have low and moderate levels of knowledge and expertise in technology leadership (Mat et al., 2019). The results of the study reveal that leadership practises in technological changes in schools are less encouraging, despite the fact that many studies and viewpoints acknowledge the relevance of ICT technology in the element of educational management (Faridah, 2016). This finding is quite concerning because school leaders are one of the most important catalysts in the success of ICT integration among teachers (Nor Asiah et al., 2019). Technology leaders have a great influence on how well ICT is used by teachers (Mohd Norakmar, Siti Noor & Abd Latif, 2020).

According to Shulman (1986), teachers should not only be subject experts and proficient in teaching pedagogy as recommended based on the Pedagogical Content Knowledge (PCK) framework, but also need to master the methods to integrate technology in teaching as suggested by Mishra and Koehler (2006) and Koehler et al., (2014) in the framework of Technological Pedagogical Content Knowledge (TPACK). Nonetheless, Zolkefli et al., (2018) discovered that teachers' technology knowledge is at moderate level. It is even more terrible that some teachers who are less sensitive to the current ICT development to be highlighted as teaching tools in the classroom (Masrurin & Bambang Yudi, 2017). While other studies indicated that the level of ability and tendency of teachers to use technology in the classroom is at a moderate level (Alt, 2018). Teachers are still found to be less effective at utilising these chances even if ICT equipment is available in classrooms (Joo et al., 2018; López-Vargas et al., 2017).Based on the literature related to the theory and model used, Figure 1 illustrates the conceptual framework of the study.

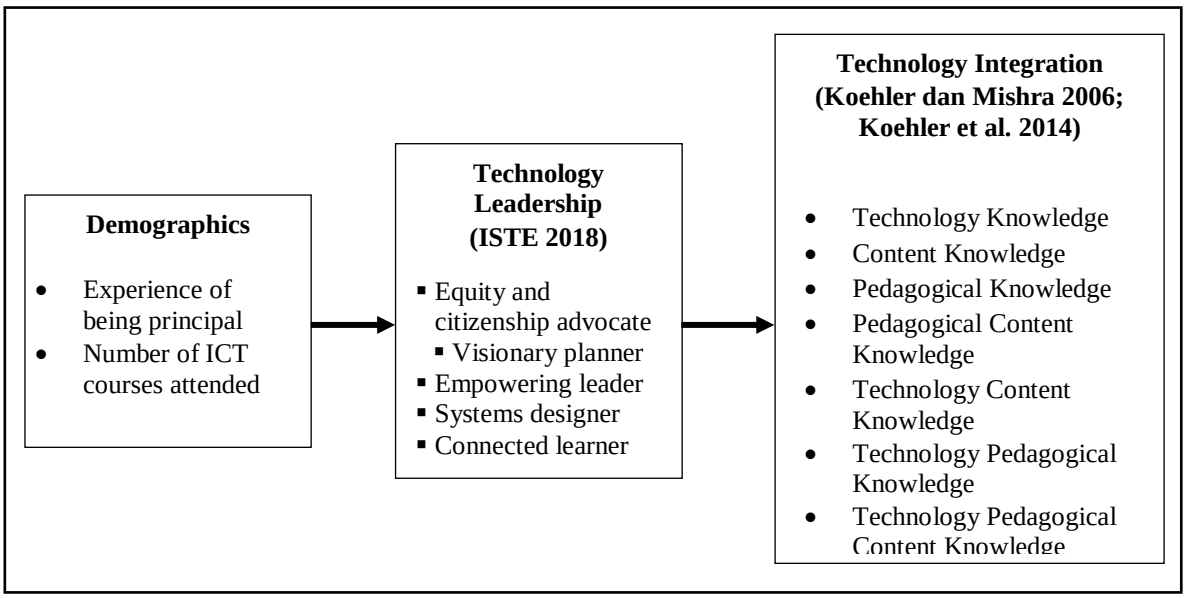

Figure 1 Conceptual Framework

This study was conducted with several specific objectives as follows:

1. Identifying the level of technology leadership practices of principals and technology integration among teachers at school.
2. Identifying differences in technology leadership practices of principals based on demographic factors (experience of being principal and number of ICT courses attended).
3. Examining the relationship between the principal's technology leadership practices and the technology integration among teachers at school.

4. Examining which dimensions in principals' technology leadership practices are dominant predictors of technology integration among teachers at school.

The two null hypotheses used in this study are as follows:

Ho1 There is no significant difference in the principal's technology leadership practices according to the experience factor of being a principal.

Ho2 There is no significant difference in the principal's technology leadership practices according to the number of ICT courses attended.

Ho3 There is no significant relationship between the principal's technology leadership practices and the integration of technology among teachers at school.

Ho4 Dimension in principal's technology leadership practice is not a predictor in promoting the integration of technology among teachers at school.

In conclusion, a study related to the technology leadership of school principals as well as the level of readiness of teachers to integrate the use of technology in the classroom should be carried out to identify their ability to ensure that the learning and teaching process in the classroom moves in line with the world's technological progress.

2. Methodology

This study is a quantitative study using a survey method that aims to collect information from part of the population related to the study variables. This study uses a multi-level random sampling technique with a population of 29,987 teachers covering the central zone of Peninsular Malaysia. However, only 492 participants in total were included in the sample for this study. The sample was selected using a multi-stage sampling technique that includes cluster sampling techniques to determine the number of teachers based on the state as well as simple random sampling techniques for the selection of teachers in each state (McMillan, 2016; MohdFaiz& Jamal Nordin, 2017).

This study uses two set of items. Firstly, principal technology leadership practices using the ISTE for Education Leader by the International Society of Technology in Education or ISTE (ISTE, 2018). Each item has an answer option in the form of a five-point Likert scale with a range of 1 to 5 (Strongly disagree – Strongly agree). Scale 1 shows that the teacher strongly disagrees that the principal shows the behavior as stated while scale 5 shows that the teacher strongly agrees that the principal shows the behavior as stated in the questionnaire. Whereas the level of technology integration among teachers was assessed using the TPACK model developed by Schmidt et al. (2009), Chai et al. (2011), and Schmid, Brianza, and Petko (2020). This section also has an answer option in the form of a five-point Likert scale with five possible responses, ranging from 1 to 5 (Strongly disagree – Strongly agree). Scale 1 shows that the teacher strongly disagrees with showing the behavior as stated while scale 5 shows that the teacher strongly agrees with showing the behavior as stated in the questionnaire. With the justification of the COVID-19 pandemic that is currently affecting the whole world, this questionnaire is distributed online only using Google Form and given a period of two weeks. The findings of the questionnaire were analyzed using Statistical Package for the Social Science (SPSS) and Smart Partial Least Squares (SmartPLS) software.

This study involved a total of 492 teachers. Table 1 shows the profile of the respondents. It consists of 70 males (14.2%) and 422 females (85.8%). Most respondents' localities are from Selangor (69.1%). In terms of experience, most teachers have been teaching for more than 20 years (33.5%) and more than 50% of them have been in their current school for more than 5 years. In terms of ICT courses that have been attended by respondents, more than 80% of them at least attended the course once.

Table 1 Respondents Profile

Profile		Frequency (n)	Percentage (%)
Gender	Male	70	14.2
	Female	422	85.8
Location	Selangor	340	69.1

	Federal Territory of Kuala Lumpur	87	17.7
	Federal Territory of Putrajaya	65	13.2
Teaching Experience	1 – 3 years	49	10.0
	3 – 5 years	36	7.3
	6 – 10 years	72	14.6
	11 – 15 years	108	22.0
	16 – 20 years	62	12.6
	More than 20 years	165	33.5
Period of Service at Current School	1 – 2 years	151	30.7
	3 – 4 years	81	16.5
	5 years and above	260	52.8
Number of ICT Related Courses Attended	Never	51	10.4
	1 – 2 times	198	40.2
	3 – 4 times	115	23.4
	5 times and above	128	26.0

3. Findings and Discussion

Findings

The level of principal technology leadership and the technology integration among teachers at school.
Table 2 shows the overall findings for the level of technology leadership among principals, and the level of technology integration among teachers, both of which are at a very high level. The highest mean score was the technology leadership variable (M=4.38, SD=0.53) followed by technology integration among teachers (M=4.27, SD=0.45).

Table2the level of technology leadership among principals and technology integration among teachers at school

Variables	***M***	***SP***	**Interpretation**
Technology Leadership	4.38	.53	Very High
Technology Integration among teachers	4.27	.45	Very High
Overall	4.36	.50	Very High

Differences in technology leadership practices of principals based on demographic factors (experience of being a principal).

The results of the MANOVA analysis through the Wilks' Lambda statistical test are shown in Table 3 below. The table shows a comparison of the mean score of technology leadership practices based on the principal's experience with Wilks' value = 0.975, F (10, 970) = 1.221, p = 0.273 (p > 0.05). This indicates that the first null hypothesis (Ho1) fails to be rejected. Therefore, it can be concluded that overall, there is no significant difference for technology leadership practices among principals based on the length of their experience as school principals.

Table3. MANOVA analysis of differences in technologyleadership dimensionsbasedon theexperience of being a principal.

Effect	Wilks' λ Value	F	Hypothesis df	Error df	Sig.
Experience	.975	1.221	10	970	.273

Differences in technology leadership practices of principals based on demographic factors (number of ICT courses attended).

Table 4 shows a comparison of the mean score of technological leadership practices based on the number of ICT courses attended with Wilks' value = 0.867, F (15, 1336.512) = 4.720, p = 0.000 (p < 0.05). This indicates that the second null hypothesis (Ho2) is rejected. Therefore, it can be concluded that overall, there is a significant difference in technology leadership practices among principals based on the number of ICT courses attended.

Table1. MANOVA analysis of differences in technology leadership dimensions based on the number of ICT courses attended.

Effect	Wilks' λ Value	F	Hypothesis df	Error df	Sig.
Number of ICT courses attended Experience	.867	4.720	15	1336.512	.000

The relationship between the principal's technology leadership practices and the technology integration among teachers at school.

Ho3 and Ho4 analyzed by PLS-SEM. There are two procedures that must be completed: the assessment of measurement and structural model (Hair et al., 2017).

Assessment of Measurement Model

These tests include internal validity, convergent validity, discriminant validity and collinearity tests. Internal validity shows that the Cronbach Alpha value is in the range of 0.985 to 0.947 and the composite reliability value is in the range of 0.987 to 0.957. Overall, both values for each dimension of this study are above 0.7. This proves that all the dimensions used in this study are accepted and have achieved a high level of internal validity and reliability. The individual values of the items (item loading) for the first and second layers also show that all the study items reach a factor weighting value of more than 0.7, an AVE value greater than 0.5 and a Composite Realiability value greater than 0.7. This situation demonstrates that the constructs used in this study have complied with the requirements for convergent validity standards. While the HTMT value for each study variable is less than 0.9. This situation shows that all study variables have reached the discriminant validity standards that have been set. The last is a collinearity test between the independent variable (technology leadership) and the dependent variable (technology integration) which shows a VIF value of less than 5.0. This means that the data of this study is free from serious multicollinearity problems.

Assessment of Structural Model

Table 5 shows the results of the direct effect model. It shows that technology leadership has a significant correlation with the technology integration among teachers at school (β = 0.413; t = 5.761), therefore the third null hypothesis is rejected. Meanwhile, the presence of the principal's technology leadership in the analysis accounted for approximately 35.6% (R2 = .356) of the variance in the integration of technology in teacher's

teaching at school, which was considered strong. R2 values of 0.02, 0.15, 0.26 are respectively defined as weak, moderate and strong (Cohen, 1988).

Table 5. Hypothesis 3 testing

Hypothesis	Path	Standardized Beta (ß)	*T* Value	P Value	Decision	R^2	Level
Ho3	TechLeadership -> Integration	0.413	5.761	0	Significant	0.356	Strong

Dimensions in the principal's technology leadership practices that are dominant predictors in promoting the integration of technology among teachers at school.

The dominant predictors of the principal's technology leadership construct can be determined by comparing the contribution of each dimension using the standard coefficient value. The Beta value shown on the standard coefficient will show each dimension's contribution to the construct. While the R value with a reading value greater than 0.75 shows that all the dimensions contribute to the construct (Hair et al., 2017). This finding has subsequently successfully rejected the forth null hypothesis (Ho4) because all dimensions in the principal's technology leadership construct are predictive factors in promoting the technology integration among teachers at school.

Table 6 shows that the visionary planner dimension is the dominant predictor with a Beta value reading of 0.932 which gives a positive contribution of 93.2% to the practice of technology integration among teachers at school, compared to the empowering leader dimension = 0.917, the connected learner dimension = 0.912, the equity and citizenship advocate dimension digital = 0.898 and the system designer = 0.894.

Table 6. Beta (ß) value for each dimension in technology leadership

Technology Leadership	R^2Value	Beta (ß)Value	Contribution
Equity and citizenship advocate	0.807	0.898	89.8%
Visionary planner	0.869	0.932	93.2%
Empowering leader	0.842	0.917	91.7%
Systems designer	0.800	0.894	89.4%
Connected learner	0.831	0.912	91.2%

4. Discussions

This study found that the principal's technology practice level is at a very high level. This finding coincides with studies by Rafidah& Muhammad (2022), NurHanisah& Mohamed Yusoff (2021), Faridah&Azlin (2020), Tisebio&Roslee (2020), Thannimalai& Raman (2018), MohdNorakmar et al. (2020), Leong, Chua &Kannan (2016), Alkrdem (2014), Fisher & Waller (2013), Noraini (2017) and Faridah&MohdIzham (2017) who found that the principal's technology leadership level is high.

This study also demonstrates the very high level of technology integration in teachers' overall instruction. The results of Arumugam et al. (2019) study, which showed that teachers were integrating technology at a high level, are supported by the findings of this study. The level of teacher technology integration was also shown to be high in various research by Mohammed Yousef &Mahizer (2016), Arumugam (2014), and Khor& Lim (2014). Al-Jaraideh (2009), Hero (2020), Almekhlafi&Almeqdadi (2010), and other international research also revealed a high level of technology integration.

In terms of demographic factor, the results of this study are consistent with Ugur&Koc (2019), who concluded that there was no significant difference for technology leadership practises based on experience. This result is also consistent with studies by Yorulmaz&Can (2016) and Hayytov (2013), which demonstrate that technologicy leadership does not show a significant difference to the experience of school's principal.

However, the study is contrary to the study by Noraini, Hamidon and MohdIzham (2015) which illustrates how having leadership experience affects people's capacity to lead and manage technology more effectively. The results of this study are also thought to be consistent with research on leadership and experience factors done by Hallinger (2010) and Shariffah (2012), which indicates that experience factors are a major component in deciding how well technology is integrated into education.
While in terms of the demographic factor of the number of ICT courses attended, the findings of this study are consistent with Faridah&MohdIzham (2017) which shows that there is a significant difference in the principal's technology leadership practices according to the number of ICT courses attended. However, in contrast to the findings of Nor Kamsiah's study, the findings of Yorulmaz&Can (2016) and Noraini, Hamidon, and MohdIzham (2015) explain how principals' participation in technology-related professional training contributes to the principal's technology leadership competence in particular (2006).

The results of the study analysis also show that there is a significant relationship between the principal's technology leadership practices and the level of technology integration among teachers at a firm level. The findings of this study are in line with the results of studies by MohdNorakmar (2022), MohdNorakmar et al. (2019), Ugur&Koc (2019), Thannimalai& Raman (2018), Anugamini&Yatish (2018), Fisher & Waller (2013), Tan (2010) and Alenezi (2016) who found that there is a significant relationship between the level of leadership the principal's technology and the level of integration of the teacher's technology.

This study also found that all dimensions in the principal's technology leadership are predictive factors in encouraging the integration of technology in teacher teaching in schools. More specifically, the analysis shows that the visionary leader dimension is the most dominant main predictor that gives a positive contribution of 93.2% to the practice of technology integration among teachers at school. The results of this study are consistent with Faridah (2016) who stated that the principal plays an important role as a leader who has a clear vision of the organization and all its citizens while the improvement of a school's academic performance also depends on good management and strategic leadership patterns. A study by Susan (2015) also shows that continuous professional development programs should focus on the ISTE standards, especially the elements of visionary leaders.

5. Conclusion

This study has successfully demonstrated that the principals in secondary schools in the central zone of Peninsular Malaysia indeed practice technological leadership. Not all demographic factors (the principal's length of experience and the number of ICT courses followed) have a relationship with the principal's technological leadership. The principal's technology leadership practices are only influenced by the number of ICT trainings attended, but not by the length of experience as a principal. The findings of the study show that technology leadership has a significant impact in influencing the integration of technology among teachers at school. The results of the analysis also found that all dimensions in the principal's technology leadership variable are predictor factors in promoting the integration of technology among teachers at school. More specifically, the analysis shows that the visionary leader dimension is the most dominant predictor. The dimension emphasizes the principal as the leader who leads the school's strategic plan in addition to being responsible and accountable for sharing information with the school community about the plan's implementation, especially related to ICT.
This study is limited by the population that only consists solely secondary school teachers in the middle zone area of Peninsular Malaysia. Therefore, the findings of the study can only be generalized to all secondary teachers under the Ministry of Education. Future respondents are suggested to involve other categories such as primary schools, government-aided schools, private schools and others. In addition, the data obtained is data from the perception of teachers as survey respondents towards principals. Therefore, teachers' perceptions of

principals for the purpose of measuring the level of leadership practices and technological leadership of their principals are likely to be too high or too low.

However, this study still helps and benefits policy makers in planning and providing appropriate courses for the professional development of principals. It includes training and programs that should emphasize 21st century leadership styles such as technology leadership to hasten and accelerate the implementation of technology in teaching and learning more effectively.

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