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A Psychology Behind Technology Integration among Teachers: the Role of Principal's Technology Leadership Practices

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Abstract:-The purpose of this study is to determine the connection between technology leadership practices among principals and technology integration among teachers. It was quantitative study involving 492 teachers fromPeninsular Malaysia. According to a descriptive analysis, the principal leads the school's teachers in integrating technology, and both of these practices are carried out to a very high standard. In terms of technology leadership practices, MANOVA analysis reveals that there is no significant difference based on the experience of being a principal, but there is a significant difference based on the quantity of ICT courses taken. Despite the structural model test reveals a substantial correlation between technological leadership by the principals and 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 in order to encourage teachers to adopt technology at schools. Meanwhile visionary planning is the primary 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 degree of technological leadership.

Keywords:*Technology leadership, technology integration, demographic*

1. Introduction

Qualities of teaching and learning now are substantially different from previous one. The purpose of learning in the 21st century tends 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.

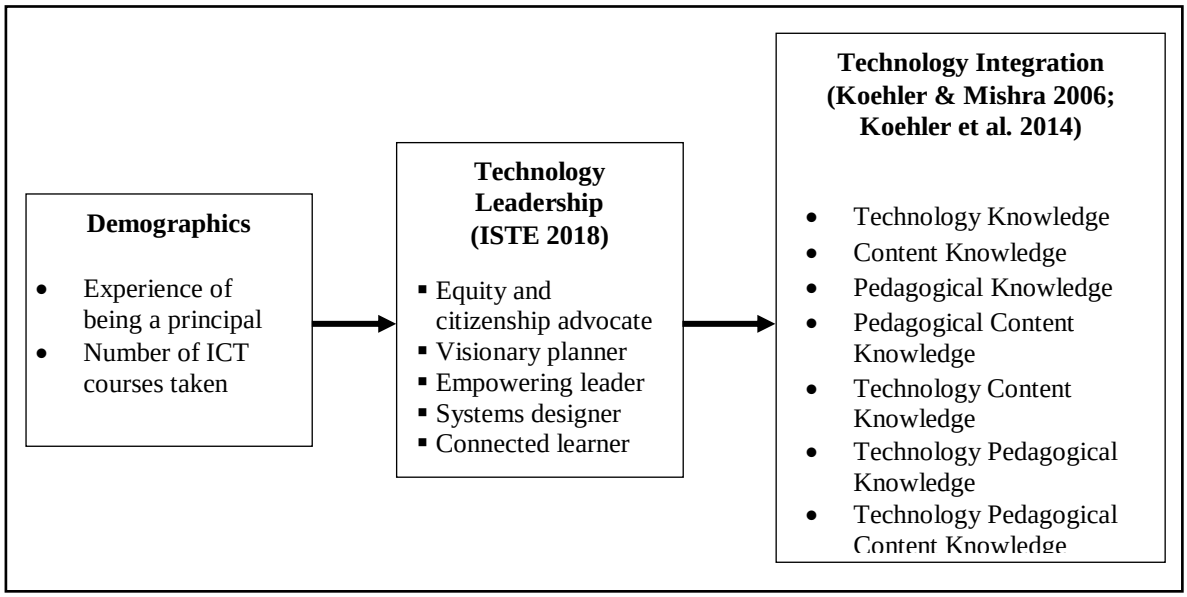
The main drivers for student success in schools are teachers and principals (KPM, 2013). At addition to overseeing administrative tasks, school leaders also act as those in charge of instruction with their main responsibility of increasing the standard of instruction and learning at their particular 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 blending of methods and strategies that are typical to leadership with special attentionto technology, especially pertaining to material accessibility, technical advancements, as well as the recognition that career progress are constantly changing in accordance with the era. The creation of a learning technology surroundings, the technology applications utilization, and entirety volume of technology use are all included in technology integration of organization (Texas Education Agency, 2010). In the meantime, teachers integrating technology when they bring out, reaffirm, evaluate, swell up, improve, and regenerate comprehension of curriculum goals (Hamilton, 2015).

Previous studyby Ozkan et al., (2017) had shown that principals' information and abilities in ICT application still fall short from the standard as suggested by NETS-A. This phenomenon shows that the principal's requirement for technology leadership is still in effect of an underachieving and inadequate level(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 study's finding 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 among the most crucial catalysts in the success of ICT integration among teachers (Nor Asiah et al., 2019). Technology leaders have a significant impact on how effectively teachers use ICT (Mohd Norakmar, Siti Noor & Abd Latif, 2020).

Teachers should not only be subject experts and proficient in teaching pedagogy as recommended by the Pedagogical Content Knowledge (PCK) framework (Shulman, 1986)Mishra and Koehler (2006) and Koehler et al., (2014) in the framework of Technological Pedagogical Content Knowledge (TPACK) also suggested that they also need to master the methods to integrate technology in teaching. 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). Joo et al., (2018) also in line with López-Vargas et al., 2017 that claimed teachers are still found to be less effective at utilising these chances even if ICT equipment is available in classrooms.
Based on literature related to the theory and model used, Figure 1 illustrates the conceptual framework of the study.

Figure 1 Conceptual Framework



Following were the study's objectives:

I. Determining the degree of principal's technology leadership practices and teacher's integration of technology at school.

II. Identifying differences in principal's technology leadership practices depending on demographics (experience of being principal and number of ICT courses taken).

III. Examining the correlation between the principal's technology leadership practicesand teacher's integration of technology at school.

IV. Examining whether dimensions in the principal's technology leadership practices are predictors in the teacher's integration of technology at school.

V. Examining which dimensions in the principal's technology leadership practices are primary predictors in the teacher's integration of technology 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 of being a principal.
Ho2 There is no significant difference in the principal's technology leadership practices according to the quantity of ICT courses taken.
Ho3 The teacher's integration of technologyat school and the principal's technology leadership practices are not significantly correlated.
Ho4 Dimensions in principal's technology leadership practicesare notpredictorsfor promoting the teacher's integration of technology.

As a conclusion, in order to determine how well teachers are prepared to integrate the use of technology in the classroom, as well as how well-equipped school principals are to do so, a study on these topics needs to be conducted. This will help determine how well teachers are able to ensure that classroom teaching and learning procedures keep pace with global technological advancement.

2. Methodology

This quantitative study uses a survey method to collect information about the study variables from a sample of the population. This study uses 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 research's sample. The sample was picked out with 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 sets of items. Firstly, the instruments used to evaluate the principal technology leadership practices is ISTE for Education Leader (ISTE, 2018). Every inquiry includes a Likert scale with a possible response on a scale from 1 to 5. The teacher is said to strongly disagree to strongly agree with the principal's reported routines in technology on a scale of 1 to 5. Whereas the TPACK model by Schmid et al. 2020 was employed to assess how well teachers have integrated technology. This section also has an answer option on a scale from 1 to 5. According to scale 5, the teacher firmly is in favour of showing the behaviour, while 1 implies that the teacher firmly disagrees. The only application utilised was Google Form to disseminate this questionnaire online and was given a period of two weeks. The findings of the questionnaire were examined utilizing *Smart Partial Least Squares (SmartPLS)* programme.

492 teachers in total contributed data to this study. There were 70 men (14.2%) and 422 women (85.8%) in that group. Selangor makes up the majority of the respondent's locality (69.1%), followed by Kuala Lumpur and Putrajaya. Seniority-wise, more than 20-years-experienced teachers were more numerous (33.5%), and more than 50% of them had previously spent more than five years in their most recent school. Nearly 90% of the respondents attended ICT courses at least once.

3. Findings and Discussion

Findings

The degree of principal's technology leadership practices and the teacher'sintegration of technology.
Table 1 summarizes the results, which demonstrate the very high levels of principal's technology leadership and teacher's integration of technology. The variable measuring technological leadership had the highest mean score (M=4.38, SD=0.53), whereas integration of technology obtained the secod-highest mean score (M=4.27, SD=0.45).

Table1 The degree of principal's technology leadership practices and teacher's integration of technology

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

Differences in Principal's Technology Leadership Practices Based on Experience of Being A Principal.

Table 2 below displays the outcomes of the MANOVA analysis using the Wilks' Lambda statistical test. Based on the principal's experience, the table compares the mean score for technology leadership practices with Wilks' value = 0.975, F (10, 970) = 1.221, and p = 0.273 (p > 0.05). This demonstrates that the first null hypothesis fails to be rejected. As a result, it can be said that, generally speaking, principals' technology leadership practices do not differ much according to how long they have been serving as school principals.

Table2 Manova analysis of differences in technology leadership dimensions basedon theexperience of being a principal.

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

Differences in principal's technology leadership practices based on quantity of ICT courses taken.

Table 3 shows a comparison of the mean score of technological leadership practices based on the quantity of ICT courses taken 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 disproved. As a result, it can be said that, overall, principal's technology leadership varies greatly depending on how many ICT courses they have taken.

Table3 MANOVA analysis of differences in technology leadership dimensions based on the quantity of ICT courses taken.

Demographic	Wilks' λ Value	F	Hypothesis df	Error df	Sig.
Quantity of ICT courses taken	.867	4.720	15	1336.512	.000

The correlation between the principal's technology leadership practices and the teacher's technology integration.

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

The Assessment of Measurement Model

These tests include internal consistency, convergent and discriminant validity as well ascollinearity tests. Internal consistency 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 circumstance shows that the constructs employed 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.

The Assessment of Structural Model

The results of the direct effect model are shown in Table 4. The third null hypothesis is rejected because it demonstrates that technological leadership has significant correlation with teachers' use of technology in the classroom (ß= 0.413; t = 5.761). Meanwhile, the presence of the principal's technology leadership in the analysis accounted for approximately 35.6% (R2 = .356) of the variance in the teacher's technology integration,

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

Table 4 Hypothesis 3 test

Hypothesis	Path	ß Value	*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 are predictors for promoting the teacher's integration of technology.

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 fourth null hypothesis (Ho4) since the principal's technology leadership encompasses all aspects are predictive factors for promoting the technology integration among teachers at school.

Table 5 R^2 value for each dimension in technology leadership

Technology Leadership	R^2 Value
Equity and citizenship advocate	0.807
Visionary planner	0.869
Empowering leader	0.842
Systems designer	0.800
Connected learner	0.831

Dimensions in The Principal's Technology Leadership Practices That Are Dominant Predictors For Promoting The Teacher's Integration Of Technology.

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. 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	Beta (ß) Value	Contribution
Equity and citizenship advocate	0.898	89.8%
Visionary planner	0.932	93.2%
Empowering leader	0.917	91.7%
Systems designer	0.894	89.4%
Connected learner	0.912	91.2%

Discussions

This study found that the principal's technology practice level is at a very high level. This finding coincides with studies by NurHanisah& Mohamed Yusoff (2021), Rafidah& Muhammad (2022), MohdNorakmar et al. (2020),

Tisebio&Roslee (2020), Faridah&Azlin (2020), Thannimalai& Raman (2018), 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 outcomes of this study support the findings of Arumugam et al. (2019) study, which demonstrated that teachers were integrating technology to a firm degree.Several studies by Mohammed Yousef &Mahizer (2016), and Khor& Lim (2014) have demonstrated that teachers are highly integrating technology. There is also a significant degree of technology integration, as reported by Hero (2020), and other international studies.

The research's findings concur withUgur&Koc (2019), who came to the conclusion that the level of experience had no statistically significant impact on the differences between technology leadership methods.This outcome also complies 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 finding 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. Additionally, it is believed that the findings of this study are in line 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 quantity of ICT courses taken, the results of this research are congruent withFaridah&MohdIzham (2017) which demonstrates that the quantity of ICT courses taken has a substantial impact on the principal's technological leadership practices. 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.

When the study's findings are examined, it becomes clear that there is a direct relationship between the principal's technology leadership techniques and the degree of teacher technology integration. The findings of this study are in line with the results of studies by MohdNorakmar (2022), Ugur&Koc (2019), MohdNorakmar et al. (2019), Anugamini&Yatish (2018), and Thannimalai& Raman (2018)who found that the level of teacher technology integration was significantly correlated with the technological leadership of the principal.

Additionally, this study discovered that all aspects of the principal's technology leadership are predictive factors for promoting the utilization of technology in teacher's teaching in classrooms. 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 teacher's technology integration at school. This study's findings support Faridah (2016) who stated that the principal plays a crucial position as a leader with a distinct vision for the school and all of its constituents 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 ISTE standards, especially the elements of visionary leaders.

4. 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 quantity of ICT courses taken) have a relationship with the technological leadership. The technology leadership practices bye the principals are only influenced by the quantity of ICT trainings taken, 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 aspects of the principal's technological leadership variable serve as predictors for encouraging teachers at the school to integrate technology. 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 in sharing information with the school community about the plan's implementation, especially related to ICT.

The population of this study is constrained because it only includes secondary school teachers in the middle zone area of Peninsular Malaysia. Therefore, only all secondary teachers under the Ministry of Education can benefit from the study's findings. Future studies are urged to include additional groups, such as primary schools, private schools, and schools with government funding. In addition, the data obtained is data from the perception of teachers as survey respondents towards principals. Therefore, teachers' perceptions of principals with the

intention of measuring the technological leadership's degree of their principals are likely to be too high or too low.

However, the study's findings may also be helpful in assisting the creation and design of appropriate initiatives for principals' continued professional development by policymakers. Principals' training and programs should emphasize the twenty-first-century leadership style derived from technology leadership to potentiate and hasten technology usage in order to bolster learning and teaching.

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