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Implementing Technology Leadership Competency Standards for School Leaders: Enhancing Educational Quality in the Digital Age

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Abstract

Technological advancements are profoundly impacting various aspects of life, including education. This study investigates the necessity of Technology Leadership Competency Standards for school leaders to facilitate technology integration in schools. Employing a qualitative approach with basic interpretive methods, the study gathered insights through expert interviews. The findings indicate that Technology Leadership Competency Standards for School Leaders are essential for enhancing educational quality in the digital age, providing structured guidance, and fostering uniformity in technology use across schools. Expert insights reveal that these standards significantly improve leadership skills, support professional development, and create a clear framework for effectively integrating technology into educational practices. Implementing these standards ensures schools are prepared for future technological challenges and fosters ongoing growth and innovation in education.

1. Introduction

Technology is changing many areas of life very quickly, such as business, health, education, communication, transportation, and human resource management (Kharchenko et al., 2020). These changes have not only made people happier and healthier, but they have also helped the economy and society grow. For instance, adding digital technologies has changed both large and small human capital management systems. This shows how important technology is to the growth of the digital economy (Kharchenko et al., 2020). Constant progress in scientific study around the world has led to the creation of new tools, software, and inventions that make technology even more useful in many areas (Martínez-Díaz et al., 2018).

According to Trust et al. (2016), technological advances like the creation of machines, tools, and management technologies have made production more flexible, raised productivity, lowered costs, and improved the quality of outputs. These improvements have also led to changes in business models, which has made running an organization easier. Integration of technology into businesses improves communication between workers and encourages them to share information (Walker et al., 2021).

Britain, the US, Germany, Spain, Turkey, and Saudi Arabia are just a few of the countries that know how important it is to use technology, especially in schools. For example, Turkey's Fatih Project Schools has done a good job of encouraging schools to use technology for management (Banoglu et al., 2016). By giving school principals, the tools and infrastructure they need to use technology in the classroom, this effort has given them the power to be technological leaders in their daily work (Banoglu et al., 2016).

In the same way, Saudi Arabia's Learning Resource Centres have turned into tech-savvy places that make it easier to use digital tools in school (Alenezi, 2016). Spanish school leaders and teachers are open to using technology in the classroom, including software, technology-focused lessons, and training in how to improve technology (Gil-Flores et al., 2017).

The Ministry of Education (MOE) in Malaysia has taken several moves to bring technology into schools for all students, teachers, and administrators. Arumugam and Som Shariff (2017) and Wong and Daud (2017) say that MOE programs like Frog VLE, Smart Schools, the 1BestariNet Program, virtual learning projects, and the Smart School Qualification Standard (SSQS) have all helped to bring technology into schools.

Because technology is changing so quickly in schools, the goal of this study is to find out if there needs to be a Technology Leadership Competency Standard just for school leaders in Malaysia. Digital tools and platforms are becoming more and more important in schools, so it is important for school administrators to know how to handle and use technology well. This study wants to find out if there needs to be a formalized set of skills for technological leadership for schools to run smoothly and efficiently in today's changing educational environment. The study will also look at the possible benefits of setting such a standard, especially in terms of making schools run better, improving teaching, and learning, and encouraging new ideas in schools.

This study is important because it fills in a gap in the current research, which has not paid much attention to the specific technological leadership tool that school leaders in Malaysia need to have. The study helps us learn more about how leadership affects the successful use of technology in schools by looking into the need for these standards. In the end, the study wants to give important information that can help educational leaders create Technology Leadership Competency Standards for School Leaders. This will make sure that schools have good technological leadership.

1.1 Technological Integration in Malaysian Education

The Virtual Learning Environment, also known as Frog VLE, has been implemented as part of the technological integration in the Malaysian education system. Frog VLE is a web-based learning system designed to enhance the learning experience beyond the classroom environment (Majid & Hasim, 2019). It aims to improve the quality of teaching and learning in Malaysian schools (et al., 2021). The system has been accessed not only by 6 million students and 450,000 teachers but also by 4.5 million parents in the country (Satiman & Zulkifli, 2022). The use of ICT, including Frog VLE, in teaching and learning has been recognized as a necessity to adapt education to the needs of 21st-century learning (Yunus et al., 2020).

These changes have reinforced the need to integrate technology into educational institutions (Ratheeswari, 2018). The significant increase in the use of technology in education has opened up opportunities for various more dynamic and progressive learning methods (Lawrence & Tar, 2018). This development indicates that technology plays an important role in the delivery and reception of knowledge in the educational context (Tino, 2003).

1.2 Models of Technological Leadership in Schools

Several models of technological leadership provide guidance and emphasize specific aspects of technology integration in schools. The Flanagan and Jacobsen (2003) Principal Technology Leadership Model highlights the principal's primary role in integrating educational technology in schools. This model outlines five elements of effective ICT integration: student engagement, shared vision, equity of access, effective professional development, and networking (Flanagan & Jacobsen, 2003).

Anderson and Dexter's (2005) Principal Technology Leadership Model underscore the critical interplay between three essential components: infrastructure, principal technology leadership, and technology outcomes. This model highlights how effective technology leadership by principals is intrinsically linked to the quality of school infrastructure and its ability to support technology integration. Principals are not only responsible for steering technological initiatives but also for ensuring that the school's infrastructure is robust enough to support these efforts. The model posits that successful technology leadership enhances infrastructure, which in turn positively impacts technology outcomes such as improved teaching methods and student learning experiences. Thus, the model provides a comprehensive framework for understanding how strong leadership and adequate infrastructure collaboratively drive successful technology integration in schools (Anderson & Dexter, 2005).

Meanwhile, Davies's (2010) Advanced Principal Technology Leadership Model emphasizes the understanding and interrelationship among members within an organization as critical aspects of technology use. This model refers to the interaction between personal/biographical, organizational, and broader social, political, and economic factors. These models provide valuable insights into shaping the roles and responsibilities of school leaders in technology integration. All these models contribute to a better understanding of the needs and challenges in implementing technology in the educational context.

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1.3 Technological Advancement in Education

It is now much easier to teach and learn in schools thanks to improvements in technology (Lawrence & Tar, 2018). The use of technology in schools has led to many projects that aim to make learning settings better for students and assist teachers in their duties. Technology tools like interactive whiteboards, learning management systems, and educational apps, for example, help make learning more fun and active for students. Also, these tools help teachers by making lesson planning easier, giving them access to a lot of digital materials, and letting them use new ways to teach. Also, technology is useful outside of school as well; it helps teachers, students, parents, and other important people communicate and work together (Tinio, 2003; Apsorn et al., 2019). All the people involved in education can stay aware and involved thanks to technology, which improves communication channels and makes the whole learning experience better.

The fast pace of technology progress affects many areas of human life. To ensure long-term and useful work performance, leadership styles need to change as well (Kuruniasih et al., 2022; Contreras et al., 2020). This means that school leaders need to change how they do things to better manage and implement changes in technology. The progress of educational technology includes not only new technologies but also the social, economic, and moral issues that come with them (Anderson & Dexter, 2005). To give an example, school leaders have to deal with problems like digital privacy, fair access to technology, and the right way to use digital resources. Keeping a modern and effective learning setting requires teachers to be able to deal with these many issues while also incorporating technology into their lessons.

Apsorn et al. (2019) say that school leaders play a key role as change drivers in bringing technology into schools. Not only do they have to push for technology to be used, but they also have to make sure that teachers have access to the right tools and chances for professional growth (Ahmad & Husain, 2022). Strong school leaders push for the inclusion of technology in the lessons and make sure that it improves the quality of teaching and learning. Achieving this means connecting technology projects to educational goals, providing ongoing support to teachers, and encouraging a culture of new ideas and constant improvement (Knapp, 2020). Additionally, school leaders must show that they are open to change and be able to help their schools through the difficulties of implementing new technology (Esplin et al., 2018). To deal with the problems that come up with new technologies, school leader need to be a good leader. School leaders need to be able to inspire and urge teachers to use technology at work (Chua & Chua, 2017; Raman et al., 2019; Esplin et al., 2020).

The Technology Leadership Competency Standards are a great way to teach school leaders how to effectively use and oversee technology in the classroom. These standards help people figure out how to use technology in the classroom in a way that adapts to the fast-paced changes that happen all the time. If school leaders follow these rules, they will be better able to handle the issues that come up when kids use technology, help students learn and teach well, and keep the learning level high. As part of its management and leadership duties, this article explains why school managers need a full document with technology leadership standards. It talks about how important structured advice is for making technology work well in school.

2. Methodology

This study uses a qualitative research approach with basic interpretive methods. Qualitative research involves gathering detailed information through interactions with subjects and objects of analysis, allowing comprehensive data collection and analysis with predetermined approaches (Yuliani et al., 2021). The interpretive method focuses on "meaning-making practices" and shows how observed results are shaped (Yuliani et al., 2021). This approach has several advantages when exploring components of technology leadership standards among school leaders.

Basic interpretive studies in qualitative research provide a deep understanding of specific phenomena through the interpretation of experiences and subjective perspectives (Uygur et al., 2020). This approach is characterized by its focus on meaning-making practices and exploring relationships between conceptual categories and previous research. Using basic interpretive methods allows researchers to gather detailed accounts of phenomena, interpret this information, and gain new insights into the topic (Uygur et al., 2020).

The advantage of using basic interpretive methods in exploring the components of technology leadership standards lies in its ability to provide a complex view of leadership in the context of technology. By investigating subjective experiences and individual perspectives, this method allows researchers to uncover the underlying meanings and interpretations related to technology leadership skills. Additionally, this method helps identify contextual and situational factors influencing technology leadership, contributing to a thorough understanding of the topic (Uygur et al., 2020). This study will use basic interpretive qualitative methods to explain direct experiences in shaping and exploring components of technology leadership standards among school leaders. Qualitative research aims to find answers to human experiences (Creswell, 2013; Holloway & Jefferson, 2000).

This study uses non-probability sampling with purposive sampling techniques. The participants in this study consist of officers and experts directly involved in leadership and technology in the state of Johor, who are potential candidates for extensive study (Patton, 2002). They willingly participate in the study (Liamputtong,

2007), are reputable (Yin, 2016; Glense, 2011), and agree to share their real experiences without any coercion or threats (Patton, 2002; Yates et al., 2012). The study includes eight experts working in various fields and expertise in the state of Johor. According to Mills and Gay (2016), the selection criteria refer to the sampling size method for the study based on criteria set by the researcher. Participants meet the sampling criteria set by the researcher, involving experts in leadership and technology. The researcher sets criteria to maintain quality assurance (Creswell, 2013).

This study includes eight participants from Johor by combining the knowledge of several participants to anticipate the results (Ab Latif et al., 2016; Robertson et al., 2017). The rationale is that several findings can provide better predictions than a single participant. Creswell (2007) and Skulmoski et al. (2007) suggest that the knowledge, experience, and background of panel members make them suitable participants for this study. This assumes that participants in the field can provide valuable insights into future developments (Keeley et al., 2016).

Participants are chosen from individuals capable of providing extensive and in-depth information and willing to cooperate fully with the researcher. This selection method means the researcher can obtain comprehensive and deep information, understand, and make findings (Patton, 2015). Participants are those who truly know the subject and can be trusted to share detailed information. All study participants have over eight years of experience in either technology or leadership. For data collection purposes, participants must agree to be interviewed. The effectiveness of the study depends on sample selection. Each participant must provide suggestions without being influenced by others. Table 1 shows that profile of participants involved in this study.

Table 1 *Profile of participants involved*

Participant	Expertise	Expertise Criteria
Participant 1 (Education Department Officer)	Leadership and Technology	Practice criteria in leadership and experience are verified through exceptional evaluation standards.
Participant 2 (Education Department Officer)	Technology	Appointed in technology after various evaluations and practices, serving as a role model in technology.
Participant 3 (Education Department Officer)	Technology	Appointed in technology after various evaluations and practices, serving as a role model in technology.
Participant 4 (District Education Officer)	Leadership	Expertise in leadership with a Ph.D. in leadership.
Participant 5 (District Education Officer)	Leadership	Expertise in leadership with practice criteria and experience verified through special evaluation standards.
Participant 6 (Headmaster A)	Leadership and Technology	School leader practising leadership and technology as a role model for over 8 years.
Participant 7 (Headmaster B)	Leadership and Technology	School leader practising leadership and technology as a role model for over 8 years.
Participant 8 (Headmaster C)	Leadership and Technology	School leader practising leadership and technology as a role model for over 8 years.

Additionally, data was gathered through in-person conversations between the researcher and the participants. The conversations, which were meant to get more specific information, gave us useful qualitative data that helped us learn more about the subject (DiCicco-Bloom & Crabtree, 2006). Audi recordings were used to record the interviews (Chua, 2012), and the people who were interviewed agreed to be listened to or taped. Later, the researcher used theme analysis (Asrial et al., 2020) to organise, categorise, and make sense of the interview data. Individual discussions allowed for more in-depth conversations and sharing of data (Morgan et al., 2013). After the transcripts were made, the players checked them to make sure they were correct.

3. Result

Based on data gathered from interviews with experts, the necessity of Technology Leadership Competency Standards for School Leaders becomes evident, as these standards play an important role in enhancing educational quality in the digital age. Table 2 illustrates that school leaders require components of technology leadership standards to guide their roles effectively. These standards provide a structured framework for school leaders to follow, ensuring that they can competently integrate technology into their institutions.

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Table 2 *The important of technology leadership standards for school leaders*

Theme		Expert
Guidance and Standards	Consistent guidance in using technology	P1, P2, P3, P4, P5, P6, P7, P8
Uniformity in Technology Use	Ensures uniformity in schools' technology approach	P1, P2, P3, P4, P5, P6, P7
Competence Development	Competence in technology leadership	P4, P5, P7
Leadership Skills Enhancement	Technology leadership skills improvement	P2, P5, P7
Framework for Assessment	Provides a clear framework for assessing technology integration	P2, P7
Professional Development	Supports professional growth and relevant training	P5, P7

Each speaker provided different angles on how technology leadership standards influence school leadership, focusing on themes such as guidance, uniformity, and enhancing leadership skills and student learning. In conclusion, the implementation of Technology Leadership Competency Standards for School Leaders is pivotal in providing a unified framework for integrating technology effectively in education. These standards not only guide school leaders in their roles but also ensure consistency, equity, and quality in technology use across educational institutions, thereby fostering an environment conducive to innovative learning and continuous improvement.

4. Discussion

Modern classrooms need good technology advice to use digital tools. Today's technology changes quickly, and school leaders need to be able to help and give clear instructions at the same time. Maintaining technology standards helps create a structured approach that supports consistency and improves the level of education. Leaders in schools can help teachers and students utilize digital tools successfully by adhering to technology standards. by following these rules, leaders can keep standards high in all school settings. Critical is making a mindset of always getting better. This way makes it easier to incorporate new technologies into the classroom, which leads to better teaching and learning.

4.1 Guidance and Standard

The Technology Leadership Competency Standards (TLCS) are important guidelines that help school leaders use technology in the classroom in a good way. Using the parts of the Technology Leadership Standard as a guide for running a school is something that all experts agree on. The purpose of these guidelines is to set a standard for how schools should run. This makes sure that leaders have the skills and knowledge to handle the complicated demands of modern schools. Several studies that look at the link between technology leadership and educational results show how important TLCS is.

Researchers have found that school managers who are good at leading with technology are better able to get teachers and students to accept technology. For example, Yahşi and Hopcan stress that as technology leadership skills rise, so does the level of acceptance of technology. This, in turn, lowers the stress of technology for school managers (Yahşi & Hopcan, 2021). This link is very important because it shows that good technology leadership can ease the stresses of integrating technology into the classroom, making the whole learning experience better.

However, Beytekin says that because technology changes so quickly, school leaders need to have both professional skills and the ability to handle complicated changes in their schools (Beytekin, 2014). It's even more complicated because not all staff members are tech-savvy. Leaders need to come up with ways to make sure that everyone in the school can use technology fairly (Beytekin, 2014).

The era of IR 4.0, teachers should use digital leadership to make schools better places to learn (Ridho et al., 2023). This change is not just about using new tools; it's also about a whole new way of leading that puts innovation and flexibility at the top of the list when it comes to how schools work. The leadership can have a big effect on how teachers use technology in their lessons (Potjanajaruwit, 2023). Setting up a stakeholder engagement framework, which Conde talked about, also shows how important it is to include different groups in the growth of technology leadership skills (Conde, 2021). This method of working together makes sure that everyone is wants and needs are taken into account, which leads to a more effective and open process of integrating technology.

Finally, the Technology Leadership Competency Standards are very important for helping school leaders figure out how to use technology in the classroom in a good way. There is proof that strong leadership in

technology not only makes teachers more open to using technology, but it also helps students do better in school. As schools continue to deal with the challenges of the digital age, the creation and use of TLCS will be key to creating an atmosphere that encourages learning and new ideas.

4.2 Uniformity in Technology Use

The Technology Leadership Competency Standards (TLCS) are a very important rule that schools must follow to make sure they use technology in a regular way. Each expert agrees that using the parts of the Technology Leadership Standard helps to make sure that everyone uses technology the same way. These standards give school leaders a way to use technology in the best way possible so that everyone is on the same page about how to adopt and use technology. Several studies that look at the link between technological leadership and the general effectiveness of educational environments stress how important these criteria are.

Research shows that school managers who are good at technological leadership are more likely to support the use of technology in a way that is consistent and works well across all their institutions. Regarding an example, the high school managers in Turkey who were very confident in their ability to lead technology were better at using technology in the classroom. In turn, this made their staff better at using technology overall (AKTA & Karaca, for example). This link suggests that leaders who are sure of themselves and good at using technology can help teachers and students use technology in a more regular way.

Additionally, good technology leadership creates a unified learning space where technology is used consistently across a range of subjects and routine tasks (Ünal et al., 2015). This level of consistency is very important to make sure that all students have the same access to technology tools, which can have a big effect on how well those kids learn. According to Hamzah et al., principals who are active in technology leadership are better able to oversee changes to the curriculum that include technology. This, in turn, encourages a consistent approach to educational technology across the school (Hamzah et al., 2016). Additional evidence for this idea comes from the work of Hamzah et al.

The good technology leadership can improve organisational cohesion and consistency in technology use (Cirtautienė & Endriulaitienė, 2018), shows how important technology leadership is for creating uniformity. Introducing the idea of unity helps with this. In educational institutions, where different levels of technology use can lead to differences in both the quality of education and the number of people who can receive it, this is very important. Directors of schools can close these gaps by following TLCS. In this way, all teachers will be sure to have the tools and knowledge they need to use modern technology effectively.

The teachers' success and their ability to use technology in the classroom are closely related to their digital leadership skills. This is more proof of how important it is to take a strategic approach to technology leadership. It shows Nawaz's results in the findings of Nawaz (2023). This link shows how important it is for school managers to not only use technology themselves, but also make it a habit for their staff to be tech-savvy. When everyone in the school does this, the use of technology will be the same across the whole building.

In conclusion, the Technology Leadership Competency Standards are very important for helping to make sure that all schools use technology in the same way. By giving school leaders the necessary skills, these standards make sure that everyone is working together to improve educational results using technology. These standards make it possible for this consistent way of integrating technology. The numbers show that good leadership in technology not only makes it easier for everyone to use technology consistently, but it also makes the learning environment fairer and more effective.

4.3 Competence Development

The Technology Leadership Competency Standards (TLCS) are essential for the development of school competence, particularly in the context of enhancing educational management and fostering effective technology integration (P4, P5, P7). These standards provide a structured framework that empowers school leaders to cultivate an environment conducive to continuous improvement and innovation in educational practices. The significance of TLCS in school competence development is supported by various studies that highlight the relationship between effective technology leadership and improved educational outcomes.

One of the primary roles of technology leadership is to enhance the overall competence of school administrators and educators. Beytekin emphasizes that school administrators' perceptions of their preparedness in technology leadership significantly influence their ability to implement technology effectively within their institutions Beytekin (2014). This preparedness is crucial as it directly impacts the administrators' confidence and willingness to embrace technological changes, which in turn fosters a culture of competence among staff and students.

Furthermore, the principals who recognize the importance of technology in schools are more likely to implement effective technology leadership practices (Waxman et al., 2013). This recognition not only enhances the principals' leadership capabilities but also promotes a shared understanding of technology's role in education

among teachers and staff. By aligning their leadership strategies with TLCS, school leaders can facilitate a more cohesive approach to technology integration, thereby enhancing the overall competence of the school.

Technology leadership competencies increase, so does the acceptance and use of technology among school administrators (Yahşi & Hopcan, 2021). This acceptance is vital for creating a supportive environment where educators feel empowered to utilize technology in their teaching practices. The study highlights that reducing technostress through effective technology leadership can lead to improved educational outcomes, as teachers are more likely to engage with technology when they feel supported by their leaders.

Furthermore, digital leadership is important for creating a mindset of creativity and skill in schools (Ridho et al., 2023). As a result, directors can improve the overall skills of the school community by giving everyone the chance to use digital tools. Engaging in these kinds of activities is very important for getting teachers and students ready for the 21st century, when using technology well is becoming more and more important. Better teaching methods are linked to school managers' levels of technology leadership self-efficacy (Ünal et al., 2015). Tech-savvy administrators can help their staff use technology in the classroom, which improves the general quality of the learning environment.

The Technology Leadership Competency Standards are very important for school competence growth. These standards create an environment where things are always getting better and new ideas are coming up because they give school leaders the skills and information they need to use technology well. The evidence shows that strong leadership in technology not only makes school administrators and teachers smarter, but it also helps students do better in school.

4.4 Leadership Skills Enhancement

To help school managers become better leaders, the Technology Leadership Competency Standards (TLCS) are very important, especially when it comes to using technology in the classroom (P4, P5, P7). The standards give leaders a structured framework to help them do their jobs when it comes to technology. They also help people build the important leadership skills needed to run a school well. Several studies show that technology leadership leads to better educational results, which supports the idea that TLCS can help improve leadership skills.

Researchers have found that school managers who are good at technology leadership are better able to teach their staff how to use technology effectively. Ünal et al. (2015), for example, found that school managers who have a lot of self-efficacies in their ability to lead with technology are more likely to use technology well, which in turn makes them better leaders. This confidence in one's own abilities is very important because it gives leaders the courage to use technology in the classroom, which creates an environment of creativity and skill in their schools.

In addition, school officials use technology in the classroom is closely linked to how well they lead technology use (AKTÅ & Karaca, 2022). They say that when managers see themselves as technology leaders, they are more likely to do things that help integrate technology, which makes them better leaders in the long run. Assisting teachers in their attempts to use technology in their lessons requires a lot of participation from all of them.

The study by Hamzah et al. (2016) says that teachers should show others how to use technology to make teaching and learning better. This shows that technology leadership can help leaders become better at their jobs. For example, school leaders can improve the general leadership capacity of the school by showing their staff how to use technology effectively. Modelling how to use technology in the classroom is important for getting teachers to agree on how to use technology, which is a key part of being a good leader.

Additionally, global leadership skills, but their focus is on psychological factors in IT companies rather than educational technology leadership in general (Cirtautienė & Endriulaitienė, 2018). So, they might not be very useful for school managers and people in charge of technology. Furthermore, teachers' success is strongly linked to their digital leadership skills. This suggests that strong technology leadership can lead to better educational outcomes. This connection shows how important it is to learn how to be a leader in a way that fits the needs of the digital age. This way, school leaders can make sure that their schools are ready for changes in technology.

To sum up, the Technology Leadership Competency Standards are important for helping school managers improve their leadership skills. Because these standards give leaders the skills, they need to successfully use technology, they encourage a culture of constant improvement and new ideas in schools. Strong leadership in technology not only makes school administrators better at their jobs, but it also seems to help kids do better in school.

4.5 Framework for Assessment

The Technology Leadership Competency Standards (TLCS) are an important part of making a strong framework for reviewing school management, especially when it comes to judging and improving school administrators' technology leadership. The guidelines give an organised way to check if someone has the skills needed to use technology well in school settings. This method helps students learn the leading skills they need to handle the complicated nature of modern education.

Researchers have found that using TLCS can make school evaluation much better. If talk about how important it is for teachers to know how they think about technology in schools because it can affect how they lead and how well technology is integrated overall (Waxman et al., 2013). By using TLCS as a method for evaluation, school leaders can learn more about their strengths and weaknesses as technology leaders. This will help them better integrate technology into teaching and learning.

School managers who are confident in their ability to lead with technology are more likely to use technology in ways that help students learn (Ünal et al., 2015). The TLCS framework lets to test this self-efficacy, which helps managers figure out their strengths and weaknesses and make personalized plans for professional growth. By comparing themselves to TLCS, school leaders can see a clear way to improve their technology leadership skills, which is important for creating a culture of innovation and constant growth in schools.

This finding emphasizes the necessity for school leaders to leverage Technology Leadership Competency Standards (TLCS) to identify effective strategies that support teachers in integrating technology into their classrooms. By utilizing TLCS, leaders can create tailored professional development programs, facilitate collaborative learning environments, and provide the necessary resources that empower educators. Such support is crucial, as it not only enhances teaching methodologies but also improves student engagement and learning outcomes. Ultimately, the strategic use of TLCS will foster a culture of continuous improvement, driving innovation in teaching practices that benefit both educators and students alike (Gyeltshen, 2021).

Furthermore, Ridho et al. (2023) say that digital leadership is important for encouraging a mindset of skill and innovation in schools. By using TLCS as a standard, school managers can see where their digital leadership skills are lacking and come up with ways to improve. This process is necessary to make sure that school leaders are ready to handle the challenges that come with technology changing so quickly (Ridho et al., 2023)

The important it is for school leaders to be good examples of how to use technology. The TLCS methodology (Hamzah et al., 2016) can be used to judge how well school leaders do this. School managers can learn a lot about how good they are at leading with technology by comparing their methods to set standards. This will help them make better decisions about their professional growth.

In conclusion, the Technology Leadership Competency Standards are an important way to measure leadership skills in school management. By using TLCS, school leaders can test their technology leadership skills, see where they need to improve, and come up with ways to make using technology in the classroom more effective. TLCS tests show that strong technology leadership not only makes school administrators better at their jobs, but it also helps kids do better in school.

4.6 Professional Development

The Technology Leadership Competency Standards (TLCS) are very important for school leaders to keep learning and growing, especially when it comes to using technology in the classroom (P5, P7). According to these standards, leaders can improve their technology skills by following a structured plan. This creates an environment that supports constant growth and good teaching and learning. Several studies that look at the link between technology leadership and the general effectiveness of educational institutions back up the importance of TLCS in professional development.

Researchers have found a link between good technology leadership and teachers' professional growth. For example, Işık stresses that the way school directors handle technology has a big effect on the professional growth of teachers, especially male teachers Işık (2023). This shows that strong leadership in technology can help educators grow professionally and improve their skills. School leaders can better help their staff learn how to use technology in the classroom by following TLCS.

Also, school managers are more likely to accept and use technology as their technology leadership skills improve (Yahşi & Hopcan, 2021). This acceptance is very important for creating a culture of ongoing professional growth because it motivates teachers to use new technologies and ways of teaching. According to the study, good technology leadership can lower technostress, which makes teachers more likely to look for professional development chances that involve using technology in the classroom.

The school managers who have a lot of confidence in their own ability to lead technology are more likely to use technology effectively (Ünal et al., 2015). The TLCS can test this self-efficacy, which helps administrators figure out what skills they need to improve and make plans for their career growth. By comparing themselves to the standards, school leaders can plan to improve their technology leadership skills, which is important for making their schools places where people are always coming up with new ideas and making things better.

The important it is for leaders to be good examples of how to use technology (Hamzah et al., 2016). School leaders can make it easy for teachers to improve their skills by showing them how to use technology well and encouraging professional development among their staff. This kind of modelling of how to use technology in the classroom is very important for getting teachers to agree on how to use technology, which is a key part of good professional development. The link between how administrators handle technology and how teachers use technology in the classroom (Raman et al., 2019). This connection shows how important it is to have professional

development programs that are in line with TLCS. These programs should give both school leaders and teachers the skills they need to use technology effectively in their lessons.

In conclusion, the Technology Leadership Competency Standards are very important for school administrators' career growth. These standards help educational institutions keep getting better and coming up with new ideas by giving them a way to test and improve technology leadership skills. Strong leadership in technology not only makes school administrators better at their jobs, but it also helps kids do better in school by facilitating effective professional development programs.

5. Conclusion

The study's result stresses how important it is for school leaders to use the Technology Leadership Competency Standards (TLCS) to deal with the problems that come with living in the digital age. The data shows that TLCS gives school leaders a structured way to improve their technology skills, makes sure that everyone uses technology the same way, and makes sure that all students have the same access to technology tools. This makes the learning setting better overall and lowers techno stress, which makes it easier for both teachers and students to use technology well. The study's goals were to find out if there should be a formalized set of skills for technology leadership and what those skills would be useful for. This study fills in a gap in the research by focusing on the specific technological leadership tools that school leaders in Malaysia need. It does this by looking at how leadership affects the effective use of technology in schools. Thus, this study not only proves that TLCS are needed, but it also gives important advice to those in charge of education in creating these standards. If schools use TLCS, they will be better able to keep up with the needs of new technology. This will make the learning setting better, more creative, and more competitive for everyone.

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Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: study conception and design: Noormawati Kamaruddin and Lutfiah Natrah Abbas@Ahmad.; data collection: Noormawati Kamaruddin.; analysis and interpretation of results: Noormawati Kamaruddin and Lutfiah Natrah Abbas@Ahmad.; draft manuscript preparation: Noormawati Kamaruddin.; proofread and review manuscript: Lee, M.F.. All authors reviewed the results and approved the final version of the manuscript.

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