INTERNATIONAL JOURNAL OF ACADEMIC RESEARCH IN PROGRESSIVE EDUCATION & DEVELOPMENT

OPEN ACCESS JOURNAL

Vol 13, Issue 4, (2024) E-ISSN: 2226-6348

Issues and Challenges of Technology Leadership in the Use of ICT Practices in Teachers' Teaching

Jeyaganesh a/l Sellvaraju

Faculty of education, National University of Malaysia, Bangi, Malaysia

Emel: p130236@siswa.ukm.edu.my

To Link this Article: http://dx.doi.org/10.6007/IJARPED/v13-i4/24366 DOI:10.6007/IJARPED/v13-i4/24366

Published Online: 27 December 2024

Abstract

Technology is one of the most important elements in 21st Century Learning (PAK21) and also in the field of educational management and administration. However, previous studies have shown that technological skills among school staff are still at a low level. This concept paper discusses the issue of technology usage in schools, focusing on ICT readiness among teachers, changes in teachers' roles, access to infrastructure and support, as well as ICT security issues. In addition, this paper elaborates on several challenges faced from the perspectives of school administrators, teachers, students, parents, and the Ministry of Education Malaysia (MOE). Furthermore, this concept paper discusses the roles of school leaders, teachers, and MOE in implementing ICT in 21st-century education. In conclusion, all parties in education need to be more aware of technological developments and be prepared to make changes, including fostering a culture of technology in schools.

Keywords: Technological Leadership, ICT, 21st Century Education

Introduction

Technology is an essential element in education, whether in the aspect of teaching and facilitation or in management and administration (Alayan, 2022). Educational technology can indeed serve as a catalyst in education, including increasing teacher motivation, commitment, and efficacy in performing their tasks and responsibilities as educators (Azam & Nor, 2021). As a result, many studies have been conducted in the field of educational technology, such as technological leadership styles, technology-assisted teaching and learning, and the integration of technology in organizational administration (Subramaniam & Izham, 2020). Therefore, studies related to technology and the practice of school leadership styles have become the focus of contemporary researchers (Esplin, Stewart & Thurston, 2018; Apsorn et al., 2019).

In Malaysia, the Malaysia Education Blueprint 2013-2025 (PPPM 2013-2025) clearly outlines 11 shifts that will underpin education as a whole. Through the 5th shift, the Ministry of Education Malaysia (MOE) is committed to ensuring that school leaders must possess high competency levels and demonstrate high performance in organizational leadership. In line with this commitment, MOE has implemented various initiatives, such as providing training

and exposure to school leaders on leadership styles that can be practiced (Gurcharan, 2019). One of the leadership styles frequently discussed by many researchers is technology leadership. Technology leadership refers to the practice of managing initiatives, including the use of technology in schools (Yusof et al., 2021). Among the initiatives in technology leadership practices are policy development, decision-making, and technology integration in schools. Additionally, technology leadership plays a crucial role in emphasizing the integration of educational technology in schools. However, there are challenges in fostering technology leadership, such as a lack of commitment, shortage of teachers or leaders, and insufficient infrastructure (Yeo & Salwana, 2021).

Technology is seen as a driver of organizational commitment, which is linked to curriculum management and teacher self-efficacy. Furthermore, schools can achieve academic excellence through principals who are technologically literate (Talip & Tiop, 2020). There is even a significant correlation between technological leadership and student academic achievement (Faridah & Izham, 2017). Headmasters recognize that the potential of technology, when aligned with a technological leadership style, can contribute to active student engagement in the classroom (Cakir, 2021). Therefore, headmasters as technological leaders should fulfill their responsibilities by setting a good example, providing encouragement and direction, and sharing knowledge and information. Technological leaders must also have a positive attitude toward technology and possess the skills to use it effectively (Thannimalai & Raman, 2018).

Technology Leadership

The technology leadership style involves incorporating technology into school leadership. Technology leadership integrates leadership strategies to enhance the quality of schools through technology. Every administrator or headmaster must demonstrate leadership by promoting technology in schools (Yeo & Salwana, 2021). Subramaniam and Izham (2020), define technological leadership as the headmaster's ability to manage ICT so that teachers and school staff can utilize it in teaching and learning or management and administration. Technology leadership can integrate technology into leadership, according to Navanitam and Izham (2020). Headmasters create policies, utilize technology, and make organizational decisions. This increases teacher support and leads to school excellence (Mohd Izham et al., 2014).

Technological leadership depends on headmasters carrying out technology-based activities and roles, according to Tiop and Talip (2020). Headmasters can indirectly improve school administration, support teaching and learning operations, and realize the vision and objectives of the organization. This leadership style encompasses visionary leadership, a digital era learning culture, excellence in professional practices, system improvements, and digital citizenship (Hamid, Ismail & Zaharudin, 2021). The NETS-A framework helps administrators and headmasters become technological leaders in schools (Yeo & Salwana, 2021). Administrators will inspire, lead development, and collaboratively implement a vision through visionary leadership (A'mar & Eleyan, 2022). In addition, headmasters will fully integrate technology to support organizational transformation and promote excellence. They will motivate and assist all stakeholders, convey a shared vision for change, achieve teaching and learning goals, increase the use of digital resources, and enhance the overall performance of the school (Bigirwa, Ndawalu & Naluwemba, 2022).

A digital era learning culture occurs when educational administrators create and foster a culture of learning based on relevant digital practices that can engage students (Norakmar, Noor & Latif, 2020). Headmasters will ensure continuous innovation in instructional practices focused on digital areas. They will also model and promote the systematic and effective use of educational technology in teaching and learning. As technology leaders, headmasters will ensure that learning environments are student-centered and technology-based in schools. Best practice strategies will be developed in the curriculum and school culture. These strategies will also encompass community learning practices grounded in collaborative, creative, and innovative elements (Yeo & Salwana, 2021).

Issues

ICT Readiness Among Teachers

21st-century education demands that teachers enhance the quality of teaching and facilitation in line with the changing times. However, technology alone is not enough to bring about excellence in schools, nor does it guarantee the success of teachers and students. The effective use of technology only occurs when it is accompanied by changes in the classroom climate and teachers' pedagogical practices.

To successfully upgrade a school, teachers' ICT readiness in terms of knowledge, skills, and attitudes is crucial. Teachers who are well-prepared in all these aspects have the potential to integrate ICT into teaching and learning operations. They are expected to help equip students with ICT knowledge and skills, as well as instill the best attitudes for character development and future educational or career pursuits (Robiah et al., 2001; Pachler, 2001).

Many teachers feel uncomfortable with ICT applications even though the equipment is adequate (Bohlin, 2002). This is because school leaders, who are key figures in leading ICT applications in schools, may feel uncomfortable leading or may be unable to do so due to a lack of understanding of what technology leadership is and their role in that effort. According to Rossafri and Balakrishnan (2017), most school leaders have low levels of knowledge and skills related to ICT and feel uncomfortable being leaders in the field of technology, or they may be uncertain about the effectiveness of technological leadership in enhancing the teaching and learning process.

This is because some principals are not fully prepared to improve their ICT competencies to manage the school organization along with the teachers (Esplin, Stewart, & Thurston, 2018). This results in schools lacking solid support to implement ICT strategic plans together. The lack of ICT readiness is the main reason why teachers do not use and integrate ICT in their teaching and learning process. This issue needs to be addressed as technology leaders and teachers are the key drivers in determining the success or failure of ICT integration programs in schools. This is further supported by Sanchez-Prieto, Huang, Olmos-Miguelanez, Garcia-Penalvo, & Teo (2019), who mention that some teachers resist change, viewing ICT as a burden. According to Goktas, Gedik, and Baydas (2013), some teachers take the easy route by not integrating ICT when carrying out teaching activities. The negative attitude of some teachers, who are accustomed to using traditional methods in the teaching process, presents a challenge in ICT integration, particularly with Web 2.0 applications in education (Rabaya and Norazah, 2014).

Conventional teaching techniques are still practiced by some teachers during process of teaching. This statement is also supported by Suppiah Nachiappan, Barathy Sinnasamy, & Suffian (2017), who note that teachers' instruction is more focused on traditional methods, such as "chalk and talk." Teaching methods like drills, memorization, and "chalk and talk" are considered outdated and irrelevant in today's context. As stated by Cuban et al. (2019), as long as teachers do not change their teaching patterns and practices, any efforts to integrate ICT will continue to face failure.

The Changing Role of Teachers

The role of teachers in the use of ICT is crucial to ensuring the effectiveness of technology in teaching and learning process. Teachers must always stay attuned to the technological changes in 21st-century education. This is because some teachers are reluctant to adapt to the rapid revolution of technology in education. According to Melvina and Jamaludin (2016), besides changes in teachers' attitudes, teachers' skills and knowledge about technology are also necessary so that they can share ideas and deliver lessons to students more effectively. Only a small number of teachers utilize Web 2.0 applications in the teaching process (Rabaya and Norazah, 2016). The Web 2.0 network offers exciting and interactive options such as Powtoon, Instagram, Facebook, Canva, YouTube, TikTok, and more. These web applications are becoming increasingly popular for both personal and commercial purposes (Noradilah & Lai, 2019). Therefore, it is a missed opportunity if teachers do not take advantage of the current technology to facilitate teaching and learning in the classroom.

In the current context of teaching and learning, traditional approaches involving face-to-face teaching in the classroom still have a place and play a critical role in students' learning. Given that teachers continue to play an important role in the classroom, they should possess ICT knowledge and skills for teaching, practice teaching that emphasizes higher-order thinking skills, and engage in student-centered activities. Teachers should also adopt a positive attitude and show a keen interest in technology to achieve effective and successful teaching goals.Conventional teaching methods have positioned teachers as the primary conveyors of information. However, with the advent of ICT, information is easily accessible in printed, electronic, and multimedia forms, leading to a shift in the role of teachers. Consequently, teachers now need to assume roles as facilitators, managers, counselors, motivators, and coordinators of learning resources (Heinich et al., 2012).

Access, Infrastructure, and Support

School facilities and infrastructure need to be improved to ensure that all teachers can fully utilize ICT. To help teachers enhance their ICT knowledge and skills, equal opportunities must be provided for them to access and use the internet and other related facilities. Appropriate measures need to be taken to encourage teachers to maximize the use of ICT in schools, especially in schools that are already equipped with various ICT facilities.

Studies by Cuban et al. (2001), Williams et al. (2000), Rahman (2000), Ashinida et al. (2004), the Educational Technology Division (2018), and Norizan and Salleh-Huddin (2017) found that the level of ICT usage in schools is still low, while Muhammad Kamarul Kabilan (2016) reported that some teachers are unable to access the internet despite the availability of such facilities in schools.Generally, the government has provided ICT equipment through

assistance allocated in the school's annual operating budget (ABM). However, not all ICT equipment can be used effectively due to damage and aging (Wong & Daud, 2017).

As a result, damaged ICT equipment in some schools is left unattended because the cost of repairing the equipment is very high. Although ICT technology in Malaysia is better than in some countries, the Ministry of Education Malaysia (MOE) faces challenges in selecting and purchasing ICT resources that are durable and effective in the long term.

According to Khlaif (2018), schools in urban areas find it easier to integrate ICT compared to rural areas. This situation is linked to the availability of quality services, including access to the internet and ICT maintenance. The location of schools also increases the likelihood that teachers will use various latest technological devices as teaching aids in the classroom (Azlin Sharina, David, Calic, & Nuzul Haqimi, 2018).

Challenges

School Administrators/Leaders

The primary challenge of being a technology leader is not just providing support in all aspects to teachers and staff. However, the critical role that school leaders must play in administering, managing, and strategizing to enhance the skills and integration of ICT among teachers is essential. Additionally, the administrator's role in ensuring internet network infrastructure and computer facilities presents a challenge in using ICT. Habibah and Vasugiammal (2015) stated that the use of technology in educational institutions is greatly influenced by the hardware and broadband facilities provided by the institution. The study by Analisa et al. (2018) found that students are unable to use ICT when they have difficulty accessing the internet. Furthermore, students often have to seek internet connections in computer labs and libraries to access learning materials shared by teachers. This results in the teaching and learning process using ICT not achieving meaningful learning. Therefore, administrators must take the internet network infrastructure and computer facilities in schools seriously.

School leaders are the main driving force in positively integrating technology in schools. Hence, school leaders, as heads of the school organization, must understand the capabilities of modern technology, not only for personal use but also to act as technology leaders who can cultivate a school culture that explores new methods in school management and teaching and learning processes (Raj, Kanesan, & Aziah, 2017; Apsorn, Sisan, & Tungkunanan, 2019).

In reality, the integration of ICT will not succeed without strong support from every member of the school. According to Norakmar et al. (2019), school leaders need to establish robust organizational administration and continuously improve through the use of ICT equipment and resources. This is supported by Leong (2017) in his study, which found that school leaders believe that the integration of ICT can enhance teacher performance and improve student achievement. This has been demonstrated through various training sessions, briefings, and exposure regarding the importance of ICT in management and teaching and learning aspects attended by school principals as school leaders.

Teachers, Students, and Parents

The challenge of using ICT in education is increasingly widespread. Teachers are required to have a deep understanding of how ICT is integrated with teaching pedagogy and curriculum

content so that the teaching and learning process is more effective and achieves quality learning outcomes. The use of ICT in teacher education has become a primary focus to ensure that teachers can utilize various technologies integrated with pedagogy and content (Mishra, Koehler & Kereluik, 2019).

Teachers and students share a close relationship, which plays a role in facilitating the teaching and learning process (Hussin, 2015). Through effective teaching and facilitation, goals can be achieved if there is continuity between the curriculum and the method of knowledge delivery through appropriate teaching approaches (Lubis et al. 2011). The maximum use of technology can train both students and teachers to become more independent and competitive (Maria Chong et al., 2014). In reality, teachers' ICT skills also serve as a catalyst for increasing self-efficacy, especially in creating a technology-based learning environment (Omar, Ismail, & Kasim, 2019).

Moreover, previous research findings have mostly focused on the positive aspects and impacts on students. For instance, teachers are urged to strengthen their ICT skills and learn new pedagogies, such as creating lesson plans using the Mobile X-Space Design medium (Lim, Hassan, Isa, & Jalil, 2018), using YouTube and multimedia in the classroom (Morat, B.N., Shaari, Abidin, & Abdullah, 2017), integrating digital Web 2.0 (Sailin, & Mahmor, 2018), and utilizing Frog VLE and i-Think (Karpudewan, & Keat, 2017) in teaching sessions. These studies show the positive effects of ICT usage in teaching and learning sessions, helping students develop their higher-order thinking skills.

Effective teaching and learning require the teacher's ability to master curriculum content and pedagogy to deliver subject topics to students. Therefore, teachers' knowledge in technology, pedagogy, and content needs to be enhanced to achieve better quality in the teaching and learning process (Sahin, 2011). Moreover, the integration of technology into teaching and learning can attract students' interest in learning (Schrum et al., 2007; Sweeder & Bednar, 2001). Technology-integrated teaching and learning will be more engaging and effective (Hicks, 2006). As a result, students' performance will show positive improvements through technology-integrated teaching and learning (Margerum-Leys & Marx, 2002).

According to Sharifah and Azman (2011), the main challenge in ensuring students use ICT effectively in learning is the students' attitude and skills. This is due to the attitude of some students who only use ICT when teachers make its use compulsory in teaching and learning. Additionally, parents also play a role in the use of ICT in education (Yu et al., 2012). The failure of parents to keep up with technological advancements in the 21st century is a challenge in using the latest applications (Mingmei Yu et al., 2012). This affects the social relationship between students, parents, and teachers in the use of ICT.

Furthermore, the socio-economic status of parents also needs to be given special attention. Parents with limited financial resources may not be able to use or benefit from technology (Tien and Fu, 2018). As a result, these parents may lack confidence in using technology due to the constraints they face (Vekiri, 2015). Consequently, they may not have the opportunity to monitor their children's use of ICT.

Suggestions for Improvement

Role of School Leaders

School administrators should encourage reflective practices among teachers. Tan et al. (2013) describe reflective practice in teaching as teachers knowing what they are doing, why they are doing it, and evaluating the impact of their actions. Additionally, teachers can apply their knowledge of education and research to formulate hypotheses regarding the effectiveness of teaching and learning strategies in the classroom, which should be regularly practiced, evaluated, and reviewed. Yusof (2007) views reflective practice as a process of deep curiosity and continuous value enhancement. Successful teachers are those who make reflective practice a part of their daily routine.

Moreover, schools should activate Peer Coaching Programs. This is a program designed to train teachers who can help their colleagues in integrating information and communication technology (ICT) through support, discussion, and the sharing of teaching practices. It is also considered a professional development method that can improve teaching quality, where teachers share skills and contribute support in learning new teaching skills and solving teaching-related problems (Dalton, 1991).

This program is seen as an excellent strategy for enhancing a teacher's professionalism because, through this strategy, teachers can update their teaching methods and improve student achievement (Joyce et al., 1996). The program's roles include stimulating personal and professional development, sharing effective teaching strategies, providing opportunities to build and use coaching skills, and helping address personal or professional issues.

Schools are also encouraged to foster a culture of teamwork. A group of two to five teachers working together to plan, implement, and evaluate learning activities for the same group of students is ideal. Teachers in such a group should ideally differ in terms of subjects taught, interests, perspectives, and levels of learning. This diversity strengthens the group and supports each member's development.

The advantage of this approach is that it can enhance student performance by increasing their responsibility for learning. Exposure to the skills and perspectives of more than one teacher can lead to a more mature understanding. Learning also becomes more active, potentially fostering teamwork among students. Studies have found that students have rated group work as truly effective in their learning (Quinn et al., 1994).

Regarding internet access, infrastructure, and support, relevant authorities, especially school administrators, must intensify efforts to promote the use of various technological tools and facilities in classrooms. Teachers' awareness of the importance and utility of ICT should also be enhanced through various activities such as exposure courses and workshops on creating teaching and learning materials.

This is important because studies conducted by Cuban et al. (2001), Williams et al. (2000), Rahman (2000), Ashinida et al. (2004), the Educational Technology Division (1999), and Norizan and Salleh-Huddin (1997), found that the level of ICT use in schools remains low. Thus, to encourage ICT use among teachers, various stakeholders, especially school administrators, need to establish mechanisms that allow all teachers to advance their skills in

ICT usage and integration for teaching and learning. This includes providing adequate computer facilities, equipping laboratories and staff rooms with internet access, and obtaining strong support from administrators in terms of financial, technical, and moral aspects. In conclusion, solid support from administrators is crucial and significantly influences the extent to which teachers use ICT in schools (Norhayati, 2005).

Role of Teachers

There are several specific strategies that can help teachers develop human capital and enhance their professionalism, including:

a) Mentoring System

One effective way to enhance professionalism among teachers is through a mentoring system in schools. This system involves a more experienced teacher acting as a role model, advisor, and mentor to less experienced teachers, facilitating their professional and personal development. This is carried out in a nurturing and supportive environment over time (Anderson and Shannon, 1995).

The mentoring process involves teaching, guiding, encouraging, counseling, and building friendships with more experienced teachers. Mentors are not only responsible for the professional development of the teachers they guide but also for their overall growth. Typically, a teacher may have one or several mentors to assist them.

b) Lifelong Learning

The concept of lifelong learning provides teachers with opportunities to read, write, and conduct action research, thereby enhancing their skills and professionalism. Knowledge is crucial in helping individuals become devout and appreciative of their Creator (Ariffin and Noraini, 2002). According to Amin (2002), English language teachers have effectively utilized Information and Communication Technology (ICT) by using VirTEC (Virtual Teacher Education Center) as a medium for knowledge sharing, which has successfully stimulated teachers in building their professionalism.

c) Staff Development Programs

Staff development plays a vital role in enhancing knowledge, skills, and expertise, fostering team spirit, and improving the quality of teaching and learning in schools. According to Sani et al. (2008), it is impossible to enhance school effectiveness or advance teacher professionalism without staff development programs. Numerous studies on staff development have shown that participation in collaborative team activities sparks new thinking and perspectives crucial for staff's professional growth (Little, 1982).

d) Lesson Study

Lesson Study activities involve students, teachers, and lecturers in the learning and teaching of mathematics, life skills, hands-on activities, and syllabus development. The primary objective is to improve mathematics educators by promoting effective teaching practices (Heral, 2003). In Japan, Lesson Study involves teachers developing lesson plans and crafting questions from the perspective of mathematics students. By analyzing these questions, teachers can create better mathematics questions.

This approach has proven to enhance teachers' professionalism in terms of teaching and various instructional methods. Lecturers, in turn, gain a clearer understanding of the challenges faced by teachers. Moreover, many teaching aids have been developed by mathematics teachers and lecturers (Marsigit, 2007). With the increased availability of diverse teaching materials, the teaching and learning process becomes more efficient.Other strategies to improve teacher professionalism include establishing career paths for teachers, identifying those who can be appointed as excellent teachers, and ensuring that teachers remain committed to their respective organizational goals and values.

Role of the Ministry of Education Malaysia

To enhance teachers' ICT skills, practical ICT courses and training sessions should be organized. The Ministry of Education Malaysia (MOE) should design a sophisticated and systematic program to provide continuous training for teachers, such as the Short Courses Managed by the Institute and other relevant courses. During these training sessions, teachers will be exposed to subject-specific skills, skill development, and enrichment in knowledge and teaching trends. Upon returning to their respective schools after attending these courses, teachers should conduct internal training to ensure that other teachers gain knowledge and skills in specific areas such as smart learning, teaching mathematics and science in English, Information and Communication Technology (ICT), or guidance and counseling.

MOE, in collaboration with the Aminuddin Baki Institute (IAB), can also provide well-planned and specialized training in technological leadership dimensions that may raise awareness and knowledge among school leaders. Continuous support, guidance, and mentoring, whether centralized or online, should be established to meet the needs of school technology leaders.MOE is encouraged to collaborate with CASTLE (Centre of Advanced Studies in Technology Leadership) at the University of Kentucky, USA. This center hosts experts who develop and disseminate the concept of technological leadership worldwide. For issues related to purchasing IT resources, ICT experts should work closely with MOE to provide guidance and advice on selecting and purchasing the best technology, ensuring that actions taken are beneficial in the long run and avoid wastage.MOE or private entities are also expected to introduce new models for enhancing teachers' professional development. There are many new models from abroad that can be modified and adapted to fit our cultural context. One current example is the Problem-Solving Cycle Model. This model involves three interconnected workshops for mathematics teachers to solve mathematical problems.

This problem-solving process offers mathematics teachers an opportunity to share learning, lesson plans, and teaching experiences. It also encourages teachers to think deeply about mathematical content and instructions. Teachers and facilitators will work together to select goals for professional development workshops in the mathematics syllabus and review new pedagogical practices (Jacob, 2005).

This model is considered crucial in building teacher professionalism, as it helps develop a productive and competitive society in an increasingly challenging world. Students require effective mathematics education to shape their future roles in society. If the authorities recognize this and take appropriate action, it will lead to the emergence of knowledgeable and skilled technological leaders in schools, capable of meeting the challenges and aspirations of the government.

Conclusion

In conclusion, technology leadership should be embraced by all school leaders to drive further integration of ICT in schools. School leaders should not become complacent with current achievements; rather, technological initiatives need to be strengthened in teaching and learning innovations to ensure the widespread integration of technology in schools.

Since this writing focuses on the issues and challenges of technology leadership towards 21st-century education, further studies can be conducted by concentrating on specific aspects of the issues discussed. Moreover, the findings of this study can serve as a guide for the Malaysian Ministry of Education to plan appropriate programs that continuously encourage and motivate school leaders and educators to foster a culture of IT literacy in schools.

Furthermore, the Ministry is committed to enhancing school performance and student achievement by improving the efficiency of the national education system. Ultimately, it is hoped that this discussion on the issues and challenges of technology leadership towards 21st-century education will provide added value and long-term impact on the technology leadership practices of school leaders, leading to the emergence of competitive technology leaders.

Acknowledgement

The author wishes to express gratitude to FND5 Grant, Research Centre of Educational Leadership and Policy, Faculty of Education, National University of Malaysia for funding the publication of this article.

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