Journal of Curriculum and Teaching; Vol. 15, No. 4; 2026
ISSN 1927-2677 E-ISSN 1927-2685
Published by Sciedu Press

# Technology-Assisted Teaching Performance: Quantitative Findings from Malaysian Public School Teachers

Samsuddin Abd Hamid[1], Miftachul Huda[1,*] & Amirah Az Zahra Ahmad Fuad[1]

[1]Sultan Idris Education University, Malim Sarjana Complex, UPSI Main Campus, Malaysia

*Correspondence: Miftachul Huda, Sultan Idris Education University, Malim Sarjana Complex, UPSI Main Campus, Malaysia. E-mail: miftachul.ifurqan@upsi.edu.my

Received: January 13, 2026 Accepted: July 18, 2026 Online Published: November 18, 2026

doi:10.5430/jct.v15n4p410 URL: https://doi.org/10.5430/jct.v15n4p410

**Abstract**

Numerous studies emphasize that educators fail to incorporate technology into the classroom. Conversely, numerous instructional resources are available online, along with various tools offered to both teachers and students in educational institutions. This study intends to evaluate the degree of technology integration in teaching and learning sessions/classrooms among educators. This research is quantitative, utilizing a survey to gather responses. The participants included 500 educators from various school types, specifically primary and secondary institutions. SPSS software (Statistical Package for the Social Sciences) was employed to analyze the data. An analysis of descriptive statistics was performed to examine the demographic traits of respondents and the extent of technology integration in teaching and learning. The findings indicate that the moderate degree of technology integration seen among teachers highlights systemic problems like insufficient professional development and support. Tackling these obstacles via thorough training initiatives, better resource access, and increased institutional backing could boost technology integration in Malaysian classrooms, enabling teachers to use technology more efficiently and promote higher student engagement and independence. Consequently, the backing of the school, MOE, and the teachers is highly stressed to completely incorporate technology into teaching and learning.

**Keywords:** technology, teaching performance, Malaysian public school teachers, quantitative findings

## 1. Introduction and Problem Identification

Governmental strategies in Malaysian education systems facilitate technological integration support. The Digital Education Policy (DEP) from the Ministry of Education Malaysia (MoE, 2023) seeks to transform the digital education scene to develop a generation that is both competitive and digitally literate. The policy is in accordance with the national agenda of Building a MADANI Nation, the Blueprint for Digital Economy Malaysia (MyDIGITAL), the Fourth Industrial Revolution (4IR), the National Digital Network (JENDELA), the Malaysia Education Blueprint (MEB) 2013 –2025, and the National Science, Technology, and Innovation Policy 2021–2030 (NSTIP). The incorporation of technology into education has become more crucial for teachers and students alike in improving the quality and efficiency of teaching and learning (Anshari et al., 2017; Hamzah et al., 2025; Daud et al., 2025; Zamri et al., 2025). The DEP seeks to enhance digital competency among educators to a peak level, fostering knowledge, creativity, and innovation in digital education comprehensively.

The efforts to enhance the quality of educational technology began in the 1980s with the introduction of computers in schools as a learning resource. Between 1999 and 2010, the Malaysian Ministry of Education invested around RM6 billion in numerous Information and Communication Technology (ICT) projects in the education field. A significant share of these funds was designated for the establishment of extra computer labs to bolster the science and mathematics through English language as the initiative. In order to achieve this, attempts to constructing computer labs in every school in Malaysia have been a strategic initiative as the extensive projects such as 1BestariNet and Frog VLE (Virtual Learning Environment), which have been implemented in schools overseen by the Ministry of Education (Junus, 2013).

Originally launched as a pilot initiative in 2004, it was later broadened to include schools nationwide in 2006 via the School Improvement program. Even though certain programs have been halted, the main goal of these technology integration efforts in the education sectors is to create an all-encompassing learning atmosphere and assist students in enhancing their ICT skills (Huda et al., 2018a; Maseleno et al., 2019; Sugiyarti et al., 2024). The student, as the central element in education systems, is entirely dependent on educators' skills in incorporating technology into the classroom (Jaafar et al., 2025; Musolin et al., 2025; Serour et al., 2025a). The integration of technology initiatives into the Malaysian education framework, as outlined in the existing plan known as PPPM (Pelan Pembangunan Pendidikan Malaysia) 2012-2023. The PPPM describes a three-step strategy for implementing technology in education. In order to respond the emerging demand, particularly in the attempts to expand technology integration plan in education, the Education Ministry seeks to strengthen the ICT basis in the education system. Main priorities involve guaranteeing sufficient access to ICT devices for both students and teachers, establishing a strong learning platform with adequate network capacity, and confirming that teachers have fundamental ICT skills (Aminin et al., 2018; Huda et al., 2018b; Serour et al., 2025b). Additional objectives involve enhancing monitoring systems, incorporating ICT into the curriculum, and providing high-quality, cost-effective educational materials. The International Society for Technology in Education (ISTE) created a series of standards called the National Education Technology Standards (NETS) to assess the effectiveness of ICT integration in educational settings. These standards address aspects like promoting student learning and creativity, creating digital learning experiences, demonstrating responsible digital citizenship, and participating in professional development and leadership (Hehsan et al., 2022; Huda et al., 2018c; Musolin et al., 2025; Serour et al., 2025c; Wahid et al., 2023). These standards highlight the importance of technical abilities as well as ethical accountability and professional development in the digital age.

In addition, the strategic orientation for technology-assisted instructional model would emphasize the incorporation of innovation in utilizing ICT within classroom settings (Rahman, Jaafar & Huda, 2023; Huda, Selamat & Salem, 2024; Muhamad et al., 2023) and thus leading to maintain the critical and creative thinking scale (Othman et al., 2016; Huda et al., 2021). During this stage, the focus moves to the introduction of innovation in ICT. As a result, it is important to take a serious concern to incorporate innovation in the application of ICT within classrooms. This stage expands on the groundwork in leading to the arrangement proportionally on ICT transformation in education will be investigated, including the adoption of education-based website for learning instruction (Huda et al., 2023a; Huda et al., 2024a; Wahid et al., 2024; Adela et al., 2018; Rahim et al., 2023). The emphasis is on synchronizing these innovations with the robust ICT foundations in the current demand on adapting the education system. The strategic effort has been enlarging with the aims to enhance best practices in excellence and innovation (Huda et al., 2023b; Sukadari & Huda, 2021; Zamri et al., 2022; Anggraeni et al., 2018). Furthermore, they will revise their approach according to new insights from global research on utilizing ICT to enhance higher-order thinking abilities.

At present, the exercise is being conducted in the targeted orientation in seeking to uphold and enhance the extensive use of innovative ICT systems within the education system, emphasizing the attainment of international standards and the elevation of technology use in pedagogy and curriculum (Huda et al., 2019a; Huda et al., 2022; Huda et al., 2023c). The objective during this phase is to support the extensive application of innovative ICT systems. The Ministry seeks to guarantee that ICT is completely woven into pedagogy and curriculum across the educational system. The emphasis will be on enhancing and broadening the application of ICT for both students and teachers in enabling them to actualise the appropriate strategy in the real setting (Masud et al., 2023; Mulyadi, Huda & Gusmian, 2022; Zamri, Muhamad & Huda, 2023).

The education industry is experiencing swift changes propelled by technological progress, a knowledge-driven economy, fierce international rivalry, and initiatives to establish a world-class educational framework (Othman and Huda, 2025; Taisin et al., 2025). These alterations have influenced not just education but have also resulted in a wider societal change to resulting in the better learning performance across the education institution. To successfully adjust to the evolving methods and approaches of instruction and education, a tactic that educators can use is incorporating technology into their teaching (Muhamad, Huda & Hashim, 2025; Riyanto et al., 2023; Zamri & Huda, 2025; Huda et al., 2024a; Sivaram et al., 2020). This progression of technology since the advent of physical media like teaching tools, audiovisuals, filmstrips, and videotapes, which have now transformed into interactive videos, satellite communications, teleconferencing, the internet, and many other educational software, demonstrates the ever-changing nature of educational technology and its expanding importance in contemporary education (Adil & Huda, 2023; Yaumi & Damopolii, 2019).

The function of teachers has changed from being instructors to facilitators, indicating a major transition from teacher-centered to student-centered education. The 21st-century educational framework highlights active learning, changing the teacher's position to that of a facilitator and guide (Miasan & Tengku Kasim, 2018; Sahmat, Zamri &

Huda, 2025; Huda, 2025). Educators are now required to do more than just teach; they must also help students with problem-solving, an essential aspect of learning. At this point of view, such shift has resulted in instructional approaches that allow students to participate in exploration, both alone and collaboratively (Tabrani et al., 2024; Ghani et al., 2025; Taisin et al., 2025; Huda et al., 2024). This method encourages self-directed learning, leveraging students' current skills and emphasizing exploration and discovery-oriented education, grounded in constructivist principles. The incorporation of technology in education allows teachers to enhance their creativity while encouraging students to connect more with their topics and pursue further knowledge throughout the learning experience (Sahmat et al., 2025; Ardani & Huda, 2025). Even with the increasing significance of incorporating technology in education, educators frequently face considerable obstacles that impede its successful execution. The drive to employ technology in educational approaches impacts the integration of technology by educators in Malaysia (Ping, Tahir, Rosli, Atan & Ali, 2024; Peng, Razak & Halili, 2024) and globally (Fütterer, Richter, & Richter, 2024; Muflihan, Prasetyaningtyas, Fajri, & Sari, 2024). Stumbrienė, Jevsikova, & Kontvainė (2024) identified multiple elements that affect teachers' motivation toward accepting and adopting technology-enabled educational innovations, such as perceived value, personal traits, social practices, organizational aspects, and factors related to technology-enabled innovations. Several factors contributing to teachers' lack of motivation to incorporate technology in their teaching methods arise from a lack of adequate skills and understanding related to technology use (Huda et al., 2025a; Nurhidayat, Mujiyanto, Yuliasri, & Hartono, 2024).

Amid the numerous strategies created to enhance instructional technology, studies highlight the difficulties arising from educators' insufficient skills in integrating technology. The inability to find and recognize specific information hinders their capacity to successfully incorporate technology into their teaching and learning methods. Educators frequently feel anxious and ashamed, worried that their technological shortcomings will be revealed to their pupils (Huda et al., 2025b; Musolin et al., 2025). The incorporation of technology in the classroom places pressure on them, requiring a strong level of ICT skills. Insufficient expertise can obstruct the implementation of technology-based teaching methods that could improve the learning experience for students. Numerous researchers highlight the importance of teacher competencies in incorporating technology into education.

This absence of knowledge impedes the implementation of technology-based teaching methods that could improve students' learning experiences. As a result, the significance of educators consistently enhancing their teaching approaches, strategies, and practices (Eden, Chisom, & Adeniyi, 2024; Huda, Jailani, & Hashim, 2025; Rosin et al., 2025). These insights together highlight the essential importance of teacher abilities and knowledge in technology integration, indicating that professional development initiatives and continuous training are crucial for preparing educators with the required skills. The learning process ought to begin in teacher training colleges, as Cullen & Greene (2011) discovered that preservice teachers encounter difficulties in locating and recognizing specific information, hindering their capability to successfully incorporate technology into their teaching and learning practices. This problem is exacerbated by the anxiety and shame that preservice teachers experience regarding their technological shortcomings being revealed to students, with some indicating that their understanding of technology in the classroom could affect students' learning experience.

Additionally, obstacles like restricted access to resources, inadequate support services, time limitations, shortage of mentors, and scarcity of chances to exchange technology integration strategies with peers affect educators' willingness to utilize ICT (Huda et al., 2023a; Taiwo Adetoun Akinde, 2024). For example, sustaining and providing computers demands significant financial resources. The lack of support staff skilled in computer maintenance leads to numerous malfunctioning computers remaining unrepaired, hindering teachers from using existing facilities and resources to improve technology-driven teaching and learning (Huda et al., 2025c). These observations collectively highlight the essential importance of teacher abilities and knowledge in integrating technology within education. Educators lead the way in educational innovation, and their capacity to adapt, learn, and utilize technology effectively is crucial for fostering dynamic and engaging learning environments.

To tackle these issues, continuous training and professional development programs are essential to provide educators with the necessary skills to fully utilize technology in teaching and learning. Tackling these external factors and challenges is crucial for establishing an environment that enables teachers to effectively incorporate technology into their teaching methods (Huda et al., 2024b; Zuhri & Huda, 2024; Zainuri & Huda, 2022). Equipping educators with essential resources, adequate time, and support enables them to navigate these challenges and utilize technology to improve student learning experiences.

On a brighter note, recent information from the Malaysian Ministry of Education indicates that teachers possess a strong level of technology literacy. As noted by Mirzajani et al., (2016), the teachers were keen on incorporating the

internet into their lessons. Furthermore, the excitement for employing the newest technological options can greatly improve the efficiency of teaching and learning, thereby indirectly speeding up students' understanding (Huda et al., 2023b; Noorhadi, Yusof, and Zurinah, 2017). Thus, educators ought to strive to implement teaching and learning methods that are imaginative and innovative to enhance students' enthusiasm for learning, making the experience enjoyable and more impactful. According to the preceding discussion, this paper seeks to evaluate the extent of technology integration in teaching and learning environments together with the classrooms engagement among educators.

## 2. Literature Review

Varied explanations of technology in education enhance the body of knowledge. Educational technology is essential in contemporary education, involving the use of scientific knowledge, methods, and tools to improve teaching and learning processes and outcomes. Finn (1960) characterizes it as a methodical strategy for addressing issues, utilizing proven techniques and frameworks that yield effective educational results. Galbraith (1967) describes technology as the organized use of scientific knowledge for practical purposes, especially in education, where it focuses on creating integrated systems for teaching and learning. This methodical approach incorporates not just scientifically validated knowledge but also experiential knowledge recognized as accurate through observation and experience. Crowell (1971), in the Encyclopedia of Education, defines educational technology as an amalgamation of individuals, tools, methods, and occurrences that enhance education favorably. This comprehensive perspective highlights the significance of technology in updating educational methods to satisfy the requirements of current education. Saettler (1990) contends that technology encompasses more than just machine usage; it involves the implementation of scientific methods, highlighting that the process is vital for improving educational practices rather than the product itself. This viewpoint views technology as a catalyst for progress and modernization, with the advancement of educational institutions frequently ascribed to the effects and influence of technological resources (Aliyu et al., 2022; Ching & Badusah, 2010; Hamzah & Attan, 2007; Shabudin et al., 2008).

Yusup Hashim (1994) characterizes technology as both a process and an outcome, crucial for national progress and system enhancement, particularly in education. The procedure utilizes scientific approaches or techniques to address issues, while the outcome is the result produced from these technological methods. Evans and Nation (2000) highlight that technology is not just a tool but the craft or discipline of applying tools for particular educational aims. This comprehension underscores the significance of utilizing technology thoughtfully to attain the intended educational results. As a result, the educational technology requires a structured approach to creating and executing teaching and learning processes to enhance their effectiveness (Leh, Anduroh & Huda, 2021; Huda et al., 2019b; Hanafi et al., 2020; Khalili et al., 2021). Moreover, classifying such educational technology into electronic mediums, including televisions, radios, computers, and projectors, as well as non-electronic mediums, such as textbooks and blackboards are crucial for assisting educators in effectively delivering educational material to learners.

The Malaysian government has consistently enhanced the education system to stay aligned with technological progress. The transition from conventional tools such as blackboards and chalk to contemporary technologies like PowerPoint and LCD projectors highlights the government's dedication to incorporating technology in education. Educational technology not only broadens current knowledge but also improves learning quality, enabling educators and students to participate in interactive and creative ways outside the classroom (Musolin et al., 2026a; Sihabudin et al., 2026; Serour et al., 2026a). Therefore, educators need to be skilled in utilizing technology to enhance its advantages in instruction and education. Educational technology acts as an essential resource in enhancing the structure, efficiency, and ability to meet students' learning goals within the educational process. At present, MoE (2024) describes digital education as the acquisition of knowledge, skills, and values related to digital technology, alongside teaching and learning methods that employ technology in a cohesive, imaginative, and innovative manner to cultivate a digitally proficient generation.

Simultaneously, the idea of integrating technology into education also developed. The incorporation of technology into education is an essential and changing component of contemporary teaching methods (Musolin et al., 2026b; Ibrahim et al., 2026; Othman et al., 2026; Ismail and Huda, 2026). Educational technology is now more reachable than in past years. Currently, technology can be employed in numerous areas, particularly in education, where it significantly contributes to improving the learning experience. The swift pace of technological development has propelled this progress, showcasing the transformations that happen with every era (Lai Kim Leong, 2002; Lau & Rosli, 2020; Lubis et al., 2017; Supramaniyam, 2015). The Malaysian Educational Technology Association, founded in 1988, promotes the advancement of educational technology to improve the quality of teaching, learning, training,

and educational management. Educational technology is a multifaceted process that systematically, scientifically, and logically evaluates educational requirements (Rahmana and Huda, 2026; Nor et al., 2026). This method seeks to create and implement combined concepts, energy, material resources, techniques, and processes to enhance the efficiency of teaching and learning activities. Pisapia (1994) emphasizes that the approach for implementing technology in schools might rely on principles such as: (1) planning; (2) curriculum; (3) instruction; (4) computer access; (5) teacher assistance; (6) effectiveness; (7) connectivity; and (8) gradual integration of activities. Technology should be closely linked with teaching strategies, and educators must incorporate ICT to enhance the educational experience. ICT integration must be considered from a wider viewpoint, utilizing ICT in a deliberate, strategic, and suitable way to enhance the efficiency and effectiveness of educational processes.

The education system needs to adjust to technological progress to remain relevant in the evolving landscape. The younger generation could experience adverse effects if this issue is overlooked. Consequently, educators need to adapt and cultivate a fresh perspective on the effects of advanced technology on society (Borham et al., 2023; Huda & Hashim, 2022; Muharom et al., 2023). They need to support students in utilizing technology, improving their tech skills, and alleviating any anxiety about technology. This change in educational methods must move from a teacher-centered approach to a student-focused learning environment, incorporating a range of ICT tools like blog development, animations, audio resources, interactive games, and others (Maseleno et al., 2018; Munusamy & Nordin, 2021; Razak et al., 2018; Yacob, 2013). These applications seek to enhance and simplify teaching techniques, rendering the learning experience more dynamic and impactful. Yaumi & Damopolii (2019) examine technology integration as the proficient and productive utilization of computers across various subjects to enable students to use their computer skills in a meaningful way. This perspective highlights the significance of incorporating technology, particularly computers, in education to improve learning results.

Studies show that creative teaching methods can engage students, reducing boredom and facilitating their comprehension of the subject matter (Rahim et al., 2026; Mustapha and Huda, 2026). The capacity to utilize ICT effectively and efficiently, creating new concepts in education, is essential for inspiring students to investigate and enhance their learning journey. Globalization and technological progress have resulted in substantial alterations in Malaysia's education system, anticipating enhanced education quality through the efficient application of ICT. Yusuf (1992) emphasizes that information literacy competence increases awareness of information needs, enhances the ability to assess and interpret information, and enables its application for knowledge-driven purposes. This skill is crucial for successfully executing these procedures (Berlian & Huda, 2022; Ismail, 2012; Mohamed, 2014). The currently strategic arrangement could highlight the necessity of upgrading educational technology infrastructure to develop ICT literate human capital, especially in teaching and learning approaches of the 21st century. This is essential as the country encounters considerable difficulties in delivering a high-quality education system.

The use of technology in education brings a fresh change in teaching methods. Numerous earlier studies have demonstrated that technology's incorporation has transformed teaching strategies, student learning techniques, and the overall educational process, matching the requirements of today's era. With the surge of information in a limitless world, educators need to stay abreast of technological progress and the complexity of knowledge (Nurapriani et al., 2026; Asrori et al. 2026). This is crucial for meeting their duties and aiding in the development of an informed and skilled nation. Proficiency in ICT enables educators to tackle the challenges in education and react appropriately to contemporary needs. The role of teachers as catalysts for social change enables them to address community needs by utilizing their expertise and abilities, acting as guides and exemplars. Teachers' ICT competencies allow students to gain knowledge and abilities aligned with their interests, talents, and potential, nurturing a passion for learning. This indirectly aids in the creation of exceptional human capital with top-tier intellects, as specified in the Education Development Master Plan (PIPP). This will ultimately result in the development of an educated and wise generation able to compete in realizing the nation's Vision 2020 and constructing a more advanced civilization.

Instructional technology's educational software has demonstrated a beneficial effect on student performance. Educators' conviction that productivity tools in educational technology aid in teaching and lesson planning; enhancing students' ICT abilities; fulfilling curriculum standards, and involving students in genuine learning experiences (Abedi, Prestridge & Hodge, 2024). Munohsamy (2014) states that incorporating the internet into education can greatly boost student engagement and, in turn, their academic success. Furthermore, educational software in instructional technology has demonstrated a beneficial effect on student performance, especially among underperforming students, resulting in improved test scores (NCREL, 2002; Newby et al., 2000). This is due to the fact that educational technology is frequently viewed as more interactive and effective than conventional approaches. Consequently, the incorporation of technology positively impacts students, enabling them to spend their leisure time

on educational activities. With the use of technology, learners can obtain sought-after information and enhance their understanding without boundaries (Noradilah & Lai Wei Sieng, 2019). Sharipah (2017) emphasizes that a significant advantage of utilizing technology is the capacity to develop an informed youth demographic, given that education is a crucial foundation for the development of young people.

The strategic instruction with potential values should additionally highlight that educational technology fosters collaborative learning strategies (Tan et al., 2024; Huda et al., 2021). In collaborative learning, every group member needs to engage actively. They must question, endorse, and enhance ideas before arriving at a consensus. This method includes collecting thoughts or information, exchanging experiences, having discussions with each other, and collaboratively addressing issues. All group members need to be dedicated to finishing their designated tasks and ready to assist one another to improve their academic success. By utilizing this approach, educators can motivate learners to engage with different teaching materials and highlight the importance of educational technology, including searching for information online and participating in related tasks. A research project carried out by the US National Foundation, as referenced in Thomas (2000), interviewed 17,355 parents and 601 students across the United States. The results showed that 53% of parents and 48% of students stated they primarily use the internet for finishing school work. Moreover, 43% of the participants stated that utilizing the internet and multimedia enhanced their academic performance in school.

## 3. Methodology

This research employed a questionnaire as the main tool for gathering data (Sugiyono, 2010). The survey was organized with a 5-point Likert scale and split into different parts: Section A contained 11 items related to demographic details like gender, teaching site, employment state, school type, work experience, academic qualifications, available school facilities, and the application of animation, internet, audio, and video in education; while Section B consisted of 5 items that centered on the incorporation of technology in education. The sample of this study included 500 educators from various schools in Malaysia, comprising 98 (19.6%) male and 402 (80.4%) female. Along with representing the population target, the sample is defined by the preferred characteristics of respondents for this research, namely those teachers having the teaching experiences in the public school context particularly considered with feasible, reachable, and representative, guaranteeing the study's relevance. Data gathering was executed using a Google doc survey and shared through Telegram and WhatsApp. The participants involved 500 teachers of varying gender, teaching locations (urban or rural), states, school types, and levels of teaching experience. The years of teaching experiences clearly indicated 32 educators (6.4%) with having less than 5 years, and 468 educators (93.6%) with having more than 5 years. In line with the professional qualifications, 133 teachers (26.6%) have a Postgraduate Teaching Course (KPLI), 116 (23.2%) hold a Postgraduate Diploma in Education (DPLI), and 251 (50.2%) earned a Bachelor's Degree in Education (ISMP), as well as information on school facilities and technology integration in teaching and learning. The research gathered responses from 500 educators, including 267 from primary schools and 233 from secondary institution and thus the collected data underwent both descriptive analysis.

## 4. Results

This research started with a survey of the technology employed by teachers in the classroom. Most educators integrate different technology-driven teaching and learning tools into their lessons. In particular, 459 educators (91.8%) indicated they used the internet, 420 educators (84%) employed audio learning tools, and 440 educators (88.0%) incorporated visual learning tools, like videos, into their teaching methods, demonstrating a significant inclination toward technology in education. The information indicates that technology has been utilized and incorporated throughout teaching and learning sessions. According to the survey, numerous resources offered in schools assist educators in utilizing technology throughout teaching and learning activities.

Consequently, upcoming studies centered on teachers' practices should be based on existing empirical evidence, especially concerning the extent of technology utilized in the classroom. This corresponds with the extensive accessibility of technology-driven teaching and learning tools available in the marketplace and on online platforms. Based on these initial findings, the current study explores the degree of technology integration by teachers, offering insights into the methods of implementation in the classroom. Multiple inquiries were made to evaluate the extent of technology incorporation in teaching and learning activities. These inquiries focused on different facets of integration, comprising: (1) the application of technology to assess students' engagement with technology as a tool or as inactive recipients of information; (2) the implementation of technology to enhance collaborative teaching and learning

experiences; (3) the utilization of technology to foster comprehension by allowing students to relate new knowledge to their existing understanding instead of just passively receiving it; (4) the deployment of technology to connect learning tasks to real-world contexts beyond the educational environment; and, (5) the adoption of technology to establish objectives, design activities, track progress, and assess outcomes, rather than merely finishing assignments without critical thought.

Table 1 presents the answers concerning the incorporation of technology in curriculum implementation. The analysis shows that most teachers utilize technology to present the content at various levels of integration. In particular, 220 teachers (44.0%) utilize technology to present curriculum content while students passively interact with the technology; 14 teachers (2.8%) require students to utilize the provided technology tools to finish assignments; 202 teachers (40.4%) motivate students to choose and modify relevant technology tools; and 22 teachers (4.4%) establish a conducive learning atmosphere that enables students to participate in activities. Just 42 teachers (8.4%) stated they provided the curriculum using means apart from technology. This suggests that although the majority of teachers utilize technology to present curriculum material to students, only 50% assist their students in investigating more advanced methods of learning the curriculum. The other teachers mainly utilize technology for their own teaching needs, failing to promote student interaction with these tools during class.

**Table 1.** Incorporation of Technology in Curriculum Implementation

| Item | N | % |
|---|---|---|
| • Educators implement the curriculum using approaches aside from technology. | 42 | 8.4 |
| • Technology is used solely by teachers to present curriculum material to students. | 220 | 44.0 |
| • Students were finishing their tasks by using the available technological resources. | 14 | 2.8 |
| • Students were urged to select suitable technology tools and motivated to tailor their usage. | 202 | 40.4 |
| • Teachers establish a positive learning atmosphere that enables students to utilize various technologies to participate in activities. | 22 | 4.4 |
| Total | 500 | 100.0 |

Table 2 shows information regarding the utilization of technology for collaborating with others in teaching and learning activities. The analysis reveals that 40 teachers (8.0%) stated that students can utilize collaborative tools such as email; 216 teachers (43.2%) mentioned that students have the chance to select and adapt technology tools; and 44 teachers (8.8%) observed that students use technology tools to collaborate with peers without time constraints and regardless of distance. In addition, 114 teachers (22.8%), noted that students utilize technology on an individual basis, whereas 86 teachers (17.2%) stated that students employ non-technological tools for collaboration. This shows different levels of technology employed in the classroom for student collaboration.

**Table 2.** Integration of Technology for Student Collaboration

| Items | N | % |
|---|---|---|
| Learners employing non-technological approaches for cooperative learning. | 86 | 17.2 |
| Students engage with technology on their own. | 114 | 22.8 |
| Students can utilize collaborative tools like email. | 40 | 8.0 |
| Students can choose and personalize technology tools during group activities. | 216 | 43.2 |
| Learners utilize technological resources to work together with peers and others, continuously across distances. | 44 | 8.8 |
| Total | 500 | 100.0 |

Table 3 presents information regarding the technology employed by teachers to enhance students' comprehension. Effective technology enables students to link new information with their existing knowledge instead of passively absorbing it. The analysis indicates that 286 teachers (57.2%) exclusively employed technology for information

delivery; 82 teachers (16.4%) allowed students to select and adapt technology tools for understanding; 69 teachers (13.8%) stated that students utilize technology to enhance understanding and link concepts across subjects; and 21 teachers (4.2%) observed that students apply technology to create and exchange knowledge. Also, 42 teachers (8.4%) indicated that students utilized learning approaches aside from technology in the classroom. This suggests that most teachers employ technology to enhance students' understanding, while some utilize it effectively in the classroom.

**Table 3.** Technologies Employed to Enhance Comprehension

| Items | N | % |
|---|---|---|
| Learners utilizing approaches apart from technology | 42 | 8.4 |
| Educators relied exclusively on technology to supply students with knowledge. | 286 | 57.2 |
| Students can select and modify technological tools to enhance comprehension. | 82 | 16.4 |
| Students utilize technology to enhance comprehension and establish links throughout the curriculum. | 69 | 13.8 |
| Students utilize technology to create and exchange knowledge. | 21 | 4.2 |
| Total | 500 | 100.0 |

Table 4 displays information regarding the application of technology to connect learning tasks to the external environment beyond the educational context. The analysis reveals that 274 teachers (54.8%) noted that students utilized technology to finish the provided activities; 80 teachers (16%) remarked that students can choose and modify technology tools for their assignments; 50 teachers (10%) mentioned that students pick suitable technology tools for real-world tasks throughout the curriculum; and 25 teachers (5%) stated that students participate in projects and problem-solving tasks outside of school. Of these, merely 71 teachers (14.2%) indicated that students utilized learning approaches aside from technology for tasks. This suggests that most teachers give students the chance to utilize technology for finishing assigned tasks.

**Table 4.** Technology Utilized for Educational Tasks

| Integration | N | % |
|---|---|---|
| Students employed non-technological learning approaches for tasks. | 71 | 14.2 |
| Students performed the tasks utilizing the technology provided. | 274 | 54.8 |
| Learners can choose and personalize technology resources to accomplish given tasks. | 80 | 16 |
| Students select suitable technological tools to accomplish real-world tasks throughout the curriculum. | 50 | 10 |
| Students engage in projects and problem-solving tasks for themselves and the community utilizing technology. | 25 | 5.0 |
| Total | 500 | 100.0 |

Table 5 presents information about utilizing technology in learning management systems to establish objectives, organize tasks, track advancements, and assess outcomes. The analysis reveals that 270 educators (54.0%) concurred that students mostly await instructions, guidance, or feedback regarding technology tools; 86 educators (17.2%) observed that students can use technology for planning, monitoring, or independently assessing activities; 68 educators (13.6%) agreed that students can fully utilize and modify technology tools, while 3 educators (0.6%) mentioned that students participate in ongoing metacognitive activities at an unreachable level. Moreover, 73 teachers (14.6%) indicated that students were utilizing learning management systems not related to technology. This signifies different degrees of utilization of the learning management system by educators.

The information presented shows a trend of incorporating technology in education, highlighting various significant patterns and challenges. Educators commonly concur that technology serves to present information to students, aiding teachers in enhancing student engagement in the classroom.

**Table 5.** Application of Technology in Learning Management Systems

| Items | N | % |
|---|---|---|
| Learners employing educational approaches apart from technology | 73 | 14.6 |
| Students simply await direction, advice, or responses to utilize the technological tools. | 270 | 54.0 |
| Students can utilize technology to independently plan, track, or assess an activity. | 86 | 17.2 |
| Students can take full advantage of and alter technological tools. | 68 | 13.6 |
| Students participate in continuous metacognitive processes at an unreachable degree. | 3 | 0.6 |
| Total | 500 | 100.0 |

## 5. Analysis and Discussion

Five questions pertain to the integration of technology. The information regarding technology utilized in curriculum delivery shows that teachers (44.0%) predominantly employ technology to convey curriculum material to students, indicating a moderate degree of integration where technology is largely teacher-driven, with students primarily absorbing the information offered. Ertmer and Ottenbreit-Leftwich (2010) highlight that simply utilizing technology for content delivery is inadequate for achieving meaningful learning. Rather, technology must be utilized to develop captivating, interactive experiences that motivate students to investigate, produce, and assess information critically. The results regarding students' collaboration through technology indicate that the majority of teachers (43.2%) allowed students to select and adjust technology tools. This is troubling, since collaboration is an essential skill in the 21st century, and technology offers many tools to support this. Study by Voogt et al. (2013) emphasizes the significance of employing technology to encourage collaborative learning, as it not only boosts engagement but also cultivates a deeper comprehension and the growth of social skills.

The third question regarding technology use by students to enhance understanding shows that technology is mainly utilized for providing information instead of allowing students to create knowledge or collaborate with peers, reflecting a minimal level of student engagement in this regard. Most educators (57.2%) exclusively utilized technology to convey information.

The fourth question regarding technology utilized to address present challenges indicates that a majority of teachers (54.8%) concentrate on technology provided to students for completing their tasks. The results demonstrate that while students employ technology to fulfill assigned activities, they lack the chance to select suitable tools for resolving issues. This indicates a reasonable degree of integration in which students receive guidance but are not enabled to choose technology tools on their own. Kirkwood and Price (2014) suggest that technology can connect classroom education with practical experience, enhancing the relevance and significance of learning for students.

The last query regarding technology for goal setting, activity planning, and progress tracking, and learning outcome evaluation reveals that teachers (54.0%) primarily dictate the instruction, leading students to rely on guidance or feedback concerning their technology use, showcasing limited student autonomy in employing technology for these aims. Research like that of Azevedo and Aleven (2013) posits that technology can enhance metacognitive practices by offering resources for planning, tracking, and contemplating learning, thereby enabling students to manage their learning experiences. This indicates a deficiency in the focus on self-regulated learning and metacognitive practices, essential for fostering independent and lifelong learners.

## 6. Conclusion

In conclusion, the observed moderate integration of technology among teachers highlights systemic problems like insufficient professional development and support. Overcoming these obstacles via extensive training initiatives, better resource availability, and enhanced institutional backing may improve technology integration in Malaysian classrooms, enabling teachers to use technology more efficiently and promote increased student engagement and independence. This challenge frequently arises due to insufficient training or resources, aligning with the noted fact that some educators are eager but not completely employing technology to effectively present the curriculum. Although technology can improve involvement, its effect is much more pronounced when students can actively interact with technology tools, instead of just passively absorbing information. To resolve these problems, it is essential to change the emphasis of technology integration from simply providing content to developing dynamic,

interactive learning settings that foster higher-order thinking, teamwork, and practical application. Effective technology integration necessitates a transition from simply employing technology as a means of delivery to utilizing it for engaging and learner-focused experiences. This can be accomplished by equipping teachers with essential professional development and resources to successfully incorporate technology in ways that improve student learning results.

**References**

Abedi, E. A., Prestridge, S., & Hodge, S. (2024). Teachers' beliefs about technology integration in Ghana: A qualitative study of teachers', headteachers' and education officials' perceptions. *Education and Information Technologies, 29*(5), 5857–5877. https://doi.org/10.1007/s10639-023-12000-x

Adela, H., Jasmi, K. A., Basiron, B., Huda, M., & Maseleno, A. (2018). Selection of dancer member using simple additive weighting. *International Journal of Engineering & Technology*, *7*(3), 1096–1107.

Adil, M., & Huda, M. (2023). Understanding responses to worship regulations in the pandemic era: text data mining analysis in the Indonesian context. *Religions*, *14*(4), 549.

Akinde, T.A. (2024). Influence of peer and technical supports on the ease-of-use of educational support systems among lecturers of library and information science in Nigerian universities. *Library and Information Perspectives and Research, 6*(1), 66–87. https://doi.org/10.47524/lipr.v6i1.67

Aliyu, J., Osman, S., Kumar, J. A., Talib, C. A., & Jambari, H. (2022). Students' engagement through technology and cooperative learning: A systematic literature review. *International Journal of Learning and Development, 12*(3), 23–40.

Aminin, S., Huda, M., Ninsiana, W., & Dacholfany, M. I. (2018). Sustaining civic-based moral values: Insights from language learning and literature. *International Journal of Civil Engineering and Technology*, *9*(4), 157–174.

Anggraeni, E. Y., Huda, M., Maseleno, A., Safar, J., Jasmi, K. A., Mohamed, A. K., ... & Masrur, M. (2018). Poverty level grouping using SAW method. *International Journal of Engineering and Technology*, *7*(2.27), 218–224.

Anshari, M., Almunawar, M. N., Shahrill, M., Wicaksono, D. K., & Huda, M. (2017). Smartphones usage in the classrooms: Learning aid or interference?. *Education and Information technologies*, *22*(6), 3063–3079.

Ardani, F., & Huda, M. (2025). ChatGPT-enhanced instructional design: Potentials to empower learning resources and tool. In X. S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Tenth International Congress on Information and Communication Technology (ICICT 2025)* (Lecture Notes in Networks and Systems, Vol. 1416). Springer. https://doi.org/10.1007/978-981-96-6441-2_3

Asrori, et al. (2026). Systematic design of online material resources for learning instruction: A critical review. In A. Iglesias, J. Shin, N. Bhatt, & A. Joshi (Eds.), *Information Systems for Intelligent Systems (ISBM 2025)* (Lecture Notes in Networks and Systems, Vol. 1748). Springer. https://doi.org/10.1007/978-3-032-12990-1_38

Azevedo, R., & Aleven, V. (2013). Metacognition and learning technologies: An overview of current interdisciplinary research. *International handbook of metacognition and learning technologies*, 1–16.

Aziz, N. & Sieng, L.W. (2019). Impak pendidikan berasaskan teknologi terhadap peningkatan prestasi pelajar di UKM. *Jurnal Personalia Pelajar, 22*(1).

Berlian, Z., & Huda, M. (2022). Reflecting culturally responsive and communicative teaching (CRCT) through partnership commitment. *Education sciences*, *12*(5), 295.

Borham, A. H., Syahdiah, U., Mohsin, M. A., Huda, M., Rahim, M. A., Ilyas, D., & Sakni, A. S. (2023, September). Information and communication ethics in social media for indigenous people's religious understanding: a critical review. In *World Conference on Information Systems for Business Management* (pp. 287–302). Singapore: Springer Nature Singapore.

Ching, M. C. H., & Badusah, J. (2010). Sikap guru Bahasa Melayu terhadap penggunaan teknologi maklumat dan komunikasi (ICT) dalam pengajaran di sekolah-sekolah rendah di Bintulu, Sarawak. *Malaysian Journal of Education, 35*(1).

Crowell T. (1971). Encyclopedia of Education. New York: Crowell Publishing Company.

Cullen, T. A., & Greene, B. A. (2011). Preservice teachers' beliefs, attitudes, and motivation about technology

integration. *Journal of Educational Computing Research, 45*(1), 29–47. https://doi.org/10.2190/EC.45.1.b

Daud, M. N., Huda, M., & Zakaria, S. K. (2025). Developing system for digital technology-based instruction: An empirical literature review evidence. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1561). Springer. https://doi.org/10.1007/978-3-032-03406-9_22

Eden, C. A., Chisom, O. N., & Adeniyi, I. S. (2024). Harnessing technology integration in education: Strategies for enhancing learning outcomes and equity. *World Journal of Advanced Engineering Technology and Sciences, 11*(2), 1–8.

Ertmer, P. A., & Ottenbreit-Leftwich, A. T. (2010). Teacher technology change: How knowledge, confidence, beliefs, and culture intersect. *Journal of Research on Technology in Education, 42*(3), 255–284. https://doi.org/10.1080/15391523.2010.10782551

Evans, T., & Nation, D. (Eds.). (2000). *Changing university teaching: Reflections on creating educational technologies*. Kogan Page.

Finn, J. D. (1960). Technology and the instructional process. Retrieved from https://eric.ed.gov/?id=ED002296

Fütterer, T., Richter, E., & Richter, D. (2024). Teachers' engagement in online professional development—The interplay of online professional development quality and teacher motivation. *Zeitschrift für Erziehungswissenschaft*. https://doi.org/10.1007/s11618-024-01245-6

Galbraith, J. K. (1967). *The new industrial state*. Houghton Mifflin.

Ghani, A.R.A., Huda, M., Sholihah, M., & Hussin, H. (2025). Tahfiz (Memorization Sciences) Curriculum Practice: An Empirical Study from Private School in Johor, Malaysia. *Nazhruna: Jurnal Pendidikan Islam*, *8*(1), 233–245.

Hamzah, I. S., Huda, M., Kaspin, K. G., Sarifin, M. R., Ayob, N. H., & Zin, S. A. M. (2025). Analysis of home-based teaching and learning challenges for secondary school students in Kampar Perak District, Malaysia. *Multidisciplinary Reviews, 8*(11), 2025329. https://doi.org/10.31893/multirev.2025329

Hamzah, M. I. M., & Attan, N. (2007). Tahap kesediaan guru sains dalam penggunaan teknologi maklumat berasaskan komputer dalam proses pengajaran dan pembelajaran. *Sains Humanika, 46*(1).

Hanafi, H. F., Wahab, M. H. A., Selamat, A. Z., Masnan, A. H., & Huda, M. (2020). A systematic review of augmented reality in multimedia learning outcomes in education. In *International conference on intelligent human computer interaction* (pp. 63–72). Cham: Springer International Publishing.

Hashim, Y. (1994). Penggunaan teknologi dalam inovasi pendidikan. *Pendidik dan Pendidikan, 13*, 72.

Hehsan, A., Huda, M., Mahsun, M., Asrori, A., Shafwan, M. H., Zakariya, D. M., ... & Layyinnati, I. (2022, October). Digital Muhadathah: framework model development for digital Arabic language learning. In *International Conference on Information and Communication Technology for Competitive Strategies* (pp. 13–29). Singapore: Springer Nature Singapore.

Huda, M. (2019). Empowering application strategy in the technology adoption: insights from professional and ethical engagement. *Journal of Science and Technology Policy Management*, *10*(1), 172–192.

Huda, M. (2022). Towards an adaptive ethics on social networking sites (SNS): a critical reflection. *Journal of Information, Communication and Ethics in Society*, *20*(2), 273–290.

Huda, M. (2023). Towards digital access during pandemic age: better learning service or adaptation struggling?. *Foresight*, *25*(1), 82–107.

Huda, M. (2024a). Trust as a key element for quality communication and information management: insights into developing safe cyber-organisational sustainability. *International Journal of Organizational Analysis*, *32*(8), 1539–1558.

Huda, M. (2024b). Between accessibility and adaptability of digital platform: investigating learners' perspectives on digital learning infrastructure. *Higher education, skills and work-based learning*, *14*(1), 1–21.

Huda, M. (2025). Quality education in artificial intelligence: promising technologically sustainable transformation for future education. In *Advancing sustainable development goals with educational technology* (pp. 401–424). IGI Global Scientific Publishing.

Huda, M., & Bakar, A. (2024). Culturally responsive and communicative teaching for multicultural integration: qualitative analysis from public secondary school. *Qualitative Research Journal*, *24*(4), 434–453.

Huda, M., & Hashim, A. (2022). Towards professional and ethical balance: insights into application strategy on media literacy education. *Kybernetes*, *51*(3), 1280–1300.

Huda, M., & Teh, K. S. M. (2018). Empowering professional and ethical competence on reflective teaching practice in digital era. In *Mentorship strategies in teacher education* (pp. 136–152). IGI Global Scientific Publishing.

Huda, M., Asrori, A., Hidayat, M. C., Saida, N., Murwanti, M., Al Amin, M., ... & Syawal, S. (2024e). Digital technology system adaptation and adoption: insights into administrative management framework system. In *Proceedings of the Computational Methods in Systems and Software* (pp. 337–344). Cham: Springer Nature Switzerland.

Huda, M., Asrori, A., Hidayat, M. C., Saida, N., Murwanti, M., Al Amin, M., Kusnanto, H., & Syawal, S. (2025b). Digital technology system adaptation and adoption: Insights into administrative management framework system. In R. Silhavy & P. Silhavy (Eds.), *Research Perspectives on Software Engineering and Systems Design (CoMeSySo 2024)* (Lecture Notes in Networks and Systems, Vol. 1492). Springer. https://doi.org/10.1007/978-3-031-96775-7_28

Huda, M., Asrori, A., Shoffan, S., Ridlwan, M., Wijayadi, W., Prajitno, S. H., Paramita, A. L., & Hamsia, W. (2025c). Ethics for information and communication technology: Critical insights into building social harmony. In R. Silhavy & P. Silhavy (Eds.), *Research Perspectives on Software Engineering and Systems Design (CoMeSySo 2024)* (Lecture Notes in Networks and Systems, Vol. 1492). Springer. https://doi.org/10.1007/978-3-031-96775-7_27

Huda, M., Borham, A. H., Hashim, A., Ritonga, M., Almunawar, M. N., Anshari, M., ... & Hanafi, H. F. (2023f). Strategic role of trust in digital communication: critical insights into building organizational sustainability. In *Proceedings of the future technologies conference* (pp. 387–403). Cham: Springer Nature Switzerland.

Huda, M., Gusmian, I., & Mulyo, M. T. (2021). Towards eco-friendly responsibilities: Indonesia field school model cross review. *Journal of Comparative Asian Development (JCAD)*, *18*(2), 1–12.

Huda, M., Hehsan, A., Basuki, S., Rismayadi, B., Jasmi, K. A., Basiron, B., & Mustari, M. I. (2019a). Empowering technology use to promote virtual violence prevention in higher education context. In *Intimacy and developing personal relationships in the virtual world* (pp. 272–291). IGI Global Scientific Publishing.

Huda, M., Jailani, M., & Hashim, A. (2025a). Gamification for transformative learning: current trends in 21st century education. In *Enhancing engagement with gamification: Education, business, and healthcare perspectives* (pp. 137–156). IGI Global Scientific Publishing.

Huda, M., Jasmi, K. A., Alas, Y., Qodriah, S. L., Dacholfany, M. I., & Jamsari, E. A. (2018e). Empowering civic responsibility: Insights from service learning. In *Engaged scholarship and civic responsibility in higher education* (pp. 144–165). IGI Global Scientific Publishing.

Huda, M., Jasmi, K. A., Embong, W. H. W., Safar, J., Mohamad, A. M., Mohamed, A. K., ... & Rahman, S. K. A. (2019b). Nurturing compassion-based empathy: innovative approach in higher education. In *Social issues surrounding harassment and assault: breakthroughs in research and practice* (pp. 144–163). IGI Global Scientific Publishing.

Huda, M., Jasmi, K. A., Hehsan, A., Mustari, M. I., Shahrill, M., Basiron, B., & Gassama, S. K. (2017b). Empowering children with adaptive technology skills: Careful engagement in the digital ınformation age. *International Electronic Journal of Elementary Education*, *9*(3), 693–708.

Huda, M., Jasmi, K. A., Mustari, I., Basiron, B., & Sabani, N. (2017c). Traditional wisdom on sustainable learning: An insightful view from Al-Zarnuji's Ta 'lim al-Muta 'allim. *Sage Open*, *7*(1), 2158244017697160.

Huda, M., Maseleno, A., Atmotiyoso, P., Siregar, M., Ahmad, R., Jasmi, K., & Muhamad, N. (2018a). Big data emerging technology: insights into innovative environment for online learning resources. *International Journal of Emerging Technologies in Learning (iJET)*, *13*(1), 23–36.

Huda, M., Maseleno, A., Atmotiyoso, P., Siregar, M., Ahmad, R., Jasmi, K., & Muhamad, N. (2018b). Big data emerging technology: insights into innovative environment for online learning resources. *International Journal of Emerging Technologies in Learning (iJET)*, *13*(1), 23–36.

Huda, M., Maseleno, A., Shahrill, M., Jasmi, K. A., Mustari, I., & Basiron, B. (2017a). Exploring adaptive teaching

competencies in big data era. *International Journal of Emerging Technologies in Learning*, *12*(3).

Huda, M., Mat Teh, K. S., Nor Muhamad, N. H., & Mohd Nasir, B. (2018c). Transmitting leadership based civic responsibility: insights from service learning. *International Journal of Ethics and Systems*, *34*(1), 20–31.

Huda, M., Mulyadi, D., Hananto, A. L., Nor Muhamad, N. H., Mat Teh, K. S., & Don, A. G. (2018d). Empowering corporate social responsibility (CSR): insights from service learning. *Social Responsibility Journal*, *14*(4), 875–894.

Huda, M., Musolin, M. H., Ahmad, A., Yauri, A. M., Bakar, A., Zuhri, M., ... & Hasanah, U. (2023a). Empowering Islamic-based digital competence and skills: how to drive it into reconstructing safety strategy from gender violence. In *Proceedings of the Computational Methods in Systems and Software* (pp. 146–164). Cham: Springer International Publishing.

Huda, M., Musolin, M. H., Ismail, M. H., Yauri, A. M., Bakar, A., Zuhri, M., ... & Hasanah, U. (2023b). From digital ethics to digital community: an Islamic principle on strengthening safety strategy on information. In *Proceedings of the Computational Methods in Systems and Software* (pp. 165–182). Cham: Springer International Publishing.

Huda, M., Musolin, M. H., Serour, R. O. H., Azman, M., Yauri, A. M., Bakar, A., ... & Hasanah, U. (2023c). Digital record management in Islamic education institution: current trends on enhancing process and effectiveness through learning technology. In *Proceedings of the Computational Methods in Systems and Software* (pp. 316–333). Cham: Springer International Publishing.

Huda, M., Nor Muhamad, N. H., Isyanto, P., Muhamat, R., Marni, N., Ahmad Kilani, M., & Safar, J. (2020). Building harmony in diverse society: insights from practical wisdom. *International Journal of Ethics and Systems*, *36*(2), 149–165.

Huda, M., Rohim, M. A., Hehsan, A. B., Qodriah, S. L., Junaidi, J., Haron, Z., ... & Abas, H. (2024a). From technology adaptation to technology adoption: an insight into public Islamic school administrative management. In *International Congress on Information and Communication Technology* (pp. 57–68). Singapore: Springer Nature Singapore.

Huda, M., Rohim, M. A., Hehsan, A. B., Qodriah, S. L., Junaidi, J., Haron, Z., & Abas, H. (2024b). From Technology Adaptation to Technology Adoption: An Insight. In *Proceedings of Ninth International Congress on Information and Communication Technology: ICICT 2024, London, Volume 8* (Vol. 1004, p. 57). Springer Nature.

Huda, M., Rohim, M. A., Hehsan, A. B., Qodriah, S. L., Junaidi, J., Haron, Z., ... & Abas, H. (2024d). From Technology Adaptation to Technology Adoption: An Insight into Public Islamic School Administrative Management. In: Yang, XS., Sherratt, S., Dey, N., Joshi, A. (eds) Proceedings of Ninth International Congress on Information and Communication Technology. ICICT 2024 2024. Lecture Notes in Networks and Systems, vol 1004. Springer, Singapore. https://doi.org/10.1007/978-981-97-3305-7_5

Huda, M., Selamat, A. Z., & Salem, S. (2024c). Investigating respect in learning as character education: A review of al-Zarnūjī's Ta 'līm al-Muta 'allim. *Nazhruna: Jurnal Pendidikan Islam*, *7*(2), 209–232.

Huda, M., Serour, R. O. H., Musolin, M. H., Azman, M., Yauri, A. M., Bakar, A., ... & Hasanah, U. (2023d). Trust in electronic record management system: insights from Islamic-based professional and moral engagement-based digital archive. In *Proceedings of the Computational Methods in Systems and Software* (pp. 303–315). Cham: Springer International Publishing.

Huda, M., Sutopo, L., Liberty, Febrianto, & Mustafa, M. C. (2022). Digital information transparency for cyber security: critical points in social media trends. In *Future of Information and Communication Conference* (pp. 814–831). Cham: Springer International Publishing.

Huda, M., Taisin, J. N., Muhamad, M., Kiting, R., & Yusuf, R. A. (2023e). Digital technology adoption for instruction aids: insight into teaching material content. In *International Conference on Information and Communication Technology for Competitive Strategies* (pp. 59–68). Singapore: Springer Nature Singapore.

Huda, M., Uripan, K. I., Asrori, A., Mochklas, M., Sya'ban, M., Maftuhah, R., Latifah, L., Poniman, P., & Suhartono, S. (2025d). Trust for communication system: Insights into digital-oriented organizational sustainability. In R. Silhavy & P. Silhavy (Eds.), *Research Perspectives on Software Engineering and Systems Design (CoMeSySo 2024)* (Lecture Notes in Networks and Systems, Vol. 1491). Springer.

https://doi.org/10.1007/978-3-031-96380-3_29

Huda, M., Yusuf, J. B., Azmi Jasmi, K., & Zakaria, G. N. (2016). Understanding Comprehensive Learning Requirements in the Light of al-Zarnūjī's Ta 'līm al-Muta 'allim. *Sage Open*, *6*(4), 2158244016670197.

Ibrahim, M. N., Huda, M., Rahman, R. B. A., & Latif, M. A. N. B. A. (2026). System development for community safety direction: A critical review from recent literature. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1564). Springer. https://doi.org/10.1007/978-3-032-04581-2_8

Ismail, A., & Huda, M. (2026). Technology management for teaching strategy: An empirical literature review. In A. Bahaaeddin & A. Hamdan (Eds.), *Digital Horizons: Reimagining Business in the Tech Era (ICBT 2025)* (Lecture Notes in Networks and Systems, Vol. 1570). Springer. https://doi.org/10.1007/978-3-032-00329-4_32

Ismail, M.F. (2012). *Pembinaan hubungan baik antara guru dengan pelajar dalam pengajaran dan pembelajaran pendidikan Islam*. Universiti Teknologi Malaysia.

Jaafar, R., Wahab, M. T. A., Wahid, A., & Huda, M. (2025). AI-enhanced instruction design: Insights into constructive learning support for Malay language. In X. S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Tenth International Congress on Information and Communication Technology (ICICT 2025)* (Lecture Notes in Networks and Systems, Vol. 1416). Springer. https://doi.org/10.1007/978-981-96-6441-2_4

Junus, N. F. (2013). *Cabaran dalam mengimplementasi virtual learning environment (VLE) Frog dalam pengajaran dan pembelajaran oleh guru di sekolah-sekolah di Malaysia* [Doctoral dissertation, Universiti Teknologi Malaysia].

Khalili, Huda, M., Rosman, A. S., Mohamed, A. K., & Marni, N. (2021). Digital learning enhancement through social network site (SNS). In *Proceedings of the Computational Methods in Systems and Software* (pp. 421–431). Cham: Springer International Publishing.

Kirkwood, A., & Price, L. (2014). Technology-enhanced learning and teaching in higher education: What is enhanced and how do we know? A critical literature review. *Learning, Media and Technology, 39*(1), 6–36. https://doi.org/10.1080/17439884.2013.770404

Lai Kim Leong. (2002). Integrasi teknologi maklumat dan komunikasi dalam pengajaran dan pembelajaran matematik. *Seminar Teknologi Maklumat dan Komunikasi dalam Pendidikan*.

Lau, J. S. C., & Rosli, R. B. (2020). Pengetahuan teknologi maklumat dan komunikasi guru matematik sekolah rendah. *Malaysian Journal of Social Sciences and Humanities (MJSSH), 5*(11), 71–84. https://doi.org/10.47405/mjssh.v5i11.538

Leh, F. C., Anduroh, A., & Huda, M. (2021). Level of knowledge, skills and attitude of trainee teachers on Web 2.0 applications in teaching geography in Malaysia schools. *Heliyon*, *7*(12).

Lubis, M. A., Hassan, W. N. S. W., & Hamzah, M. I. (2017). Tahap pengetahuan dan kesediaan guru-guru pendidikan Islam sekolah menengah di Selangor terhadap penggunaan multimedia dalam pengajaran pendidikan Islam. *ASEAN Comparative Education Research Journal on Islam and Civilization (ACER-J), 1*(1), 1–13.

Maseleno, A., Huda, M., Jasmi, K. A., Basiron, B., Mustari, I., Don, A. G., & bin Ahmad, R. (2019). Hau-Kashyap approach for student's level of expertise. *Egyptian Informatics Journal*, *20*(1), 27–32.

Maseleno, A., Sabani, N., Huda, M., Ahmad, R., Jasmi, K. A., & Basiron, B. (2018). Demystifying learning analytics in personalised learning. *International Journal of Engineering & Technology*, *7*(3), 1124–1129.

Masud, A., Borham, A. H., Huda, M., Rahim, M. M. A., & Husain, H. (2023). Managing information quality for learning instruction: insights from public administration officers' experiences and practices. In *Proceedings of the Computational Methods in Systems and Software* (pp. 41–49). Cham: Springer Nature Switzerland.

Miasan, N. A., & Tengku Kasim, T. S. A. (2018). Pengamalan m-pembelajaran dalam kalangan guru novis pendidikan Islam di Sabah. *Journal of Islamic Educational Research, 3*(1), 11–20. https://ejournal.um.edu.my/index.php/JIER/article/view/18123

Ministry of Education (MOE) Malaysia. (2024). Pelan Strategik Kementerian Pendidikan Malaysia 2024–2030 [launched the Strategic Education Plan 2024–2030]. Retrieved from https://www.moe.gov.my/storage/files/shares/Bahagian%20dan%20Unit/Bahagian%20Perancangan%20Strategik%20Dan%20Hubungan%20Antarabangsa/Pelan%20Strategik%20KPM%202024-2030.pdf

Ministry of Education, Malaysia. (2023). *Digital Education Policy*. Ministry of Education, Malaysia.

Mirzajani, H., Mahmud, R., Fauzi Mohd Ayub, A., & Wong, S. L. (2016). Teachers' acceptance of ICT and its integration in the classroom. *Quality Assurance in Education*, *24*(1), 26–40.

Mohamed, Z. (2014). *Integriti guru dalam pelaksanaan pentaksiran berasaskan sekolah kurikulum standard sekolah rendah di empat buah sekolah rendah di daerah Tampoi, Johor Bahru*. Universiti Teknologi Malaysia.

Muflihan, Y., Prasetyaningtyas, W., Fajri, N., & Sari, N. (2024). Meta-analysis study: The influence of motivation on teacher performance in Indonesia. *Formosa Journal of Science and Technology, 3*(2), 289–306. https://doi.org/10.55927/fjst.v3i2.8324

Muhamad, N., Huda, M., & Hashim, A. (2025). Development for administrating school data management: An empirical review. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1561). Springer. https://doi.org/10.1007/978-3-032-03406-9_15

Muhamad, N., Huda, M., & Hashim, A. (2025, April). System development for administrating school data management: an empirical review. In *Computer Science On-line Conference* (pp. 238–249). Cham: Springer Nature Switzerland.

Muhamad, N., Huda, M., Hashim, A., Tabrani, Z. A., & Maárif, M. A. (2023, December). Managing technology integration for teaching strategy: public school educators' beliefs and practices. In *International Conference on Information and Communication Technology for Competitive Strategies* (pp. 385–400). Singapore: Springer Nature Singapore.

Muharom, F., Farhan, M., Athoillah, S., Rozihan, Muflihin, A., & Huda, M. (2023, December). Digital technology skills for professional development: insights into quality instruction performance. In *International Conference on Information and Communication Technology for Competitive Strategies* (pp. 371–384). Singapore: Springer Nature Singapore.

Mulyadi, D., Huda, M., & Gusmian, I. (2022). Smart learning environment (SLE) in the fourth industrial revolution (IR 4.0): practical insights into online learning resources. *International Journal of Asian Business and Information Management (IJABIM)*, *13*(2), 1–23.

Munohsamy, T. (2014). Integrasi teknologi maklumat dan komunikasi dalam pendidikan. *Journal IPA, 7*(23), 219–232.

Munusamy, N., & Nordin, N. M. (2021). Tahap pengetahuan dan kesediaan guru bahasa Tamil terhadap penggunaan teknologi dalam pembelajaran dan pemudahcaraan. *Jurnal Dunia Pendidikan, 3*(1), 666–682.

Musolin, M. H., Ismail, M. H., Farhan, M., Rois, N., Ismail, A., Huda, M., & Rohim, M. A. (2025a). Understanding of artificial intelligence for Islamic education support and service: Insights from empirical literature review. In X. S. Yang, R. S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Ninth International Congress on Information and Communication Technology (ICICT 2024)* (Lecture Notes in Networks and Systems, Vol. 1054). Springer. https://doi.org/10.1007/978-981-97-5035-1_3

Musolin, M. H., Ismail, M. H., Huda, M., Qodriah, S. L., Hassan, R. R., Ismail, A., & Siregar, M. (2025b). Toward an Islamic education administration system: A critical contribution from technology adoption. In X. S. Yang, R. S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Ninth International Congress on Information and Communication Technology (ICICT 2024)* (Lecture Notes in Networks and Systems, Vol. 1054). Springer. https://doi.org/10.1007/978-981-97-5035-1_23

Musolin, M. H., Serour, R. O. H., & Huda, M. (2025c). Developing system for online archive management in Islamic education: An empirical literature review. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1559). Springer. https://doi.org/10.1007/978-3-032-00712-4_19

Musolin, M. H., Serour, R. O. H., & Huda, M. (2026). Modern learning environment for teaching Islamic education: An empirical literature review. In A. Bahaaeddin & A. Hamdan (Eds.), *Digital Horizons: Reimagining Business in the Tech Era (ICBT 2025)* (Lecture Notes in Networks and Systems, Vol. 1570). Springer. https://doi.org/10.1007/978-3-032-00329-4_33

Mustapha, R., & Huda, M. (2026). Professionally digital skills for teaching work performances: A critical review. In A. Bahaaeddin & A. Hamdan (Eds.), *The Digital Blueprint: Crafting Business Models for the Tech Future*

*(ICBT 2025)* (Lecture Notes in Networks and Systems, Vol. 1576). Springer. https://doi.org/10.1007/978-3-032-00549-6_18

Naseer, F., & Khawaja, S. (2025). Mitigating conceptual learning gaps in mixed-ability classrooms: A learning analytics-based evaluation of AI-driven adaptive feedback for struggling learners. *Applied Sciences*, *15*(8), 4473.

Nor, N. M. M., Hanapi, M. H. M., Zainuddin, N. A., Huda, M., & Uripan, K. I. (2026). System development of digital electronic archive trust for social learning culture: A review. In A. Iglesias, J. Shin, N. Bhatt, & A. Joshi (Eds.), *Information Systems for Intelligent Systems (ISBM 2025)* (Lecture Notes in Networks and Systems, Vol. 1742). Springer. https://doi.org/10.1007/978-3-032-12987-1_39

Nurapriani, F., Isyanto, P., Sihabudin, Fadli, U. M. D., Hananto, A. L., & Huda, M. (2026). System development of digital multimedia for instruction tool: An empirical literature evidence. In J. Choudrie, P. N. Mahalle, T. Perumal, & A. Joshi (Eds.), *ICT for Intelligent Systems (ICTIS 2025)* (Lecture Notes in Networks and Systems, Vol. 1518). Springer. https://doi.org/10.1007/978-981-96-8898-2_44

Nurhidayat, E., Mujiyanto, J., Yuliasri, I., & Hartono, R. (2024). Technology integration and teachers' competency in the development of 21st-century learning in EFL classroom. *Journal of Education and Learning (EduLearn), 18*(2), 342–349. https://doi.org/10.11591/edulearn.v18i2.21048

Othman, M. A. B., Hassan, R. R., Suliman, M. S., & Huda, M. (2026). System development for ethics in digital record archive: Insight from strategically critical review. In A. Iglesias, J. Shin, N. Bhatt, & A. Joshi (Eds.), *Information Systems for Intelligent Systems (ISBM 2025)* (Lecture Notes in Networks and Systems, Vol. 1756). Springer. https://doi.org/10.1007/978-3-032-13196-6_15

Othman, R., Shahrill, M., Mundia, L., Tan, A., & Huda, M. (2016). Investigating the relationship between the student's ability and learning preferences: evidence from year 7 mathematics students. *The New Educational Review*, *44*, 125–138.

Othman, S., & Huda, M. (2025). Digitally gamified instructional design (DGID): Insights into empowering digital learning environment. In X. S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Tenth International Congress on Information and Communication Technology (ICICT 2025)* (Lecture Notes in Networks and Systems, Vol. 1416). Springer. https://doi.org/10.1007/978-981-96-6441-2_2

Peng, R., Razak, R. A., & Halili, S. H. (2024). Exploring the role of attitudes, self-efficacy, and digital competence in influencing teachers' integration of ICT: A partial least squares structural equation modeling study. *Heliyon, 10*(13). https://doi.org/10.1016/j.heliyon.2024.e33750

Ping, C. S., Tahir, L. M., Rosli, M. S., Atan, N. A., & Ali, M. F. (2024). Challenges and barriers to e-leadership participation: Examining the perspectives of Malaysian secondary school teachers. *Education and Information Technologies*. https://doi.org/10.1007/s10639-024-13025-6

Pisapia, J. (1994). *Restructuring schools with technology*. Metropolitan Educational Research Consortium.

Rahim, M. M. A., Huda, M., Borham, A. H., & Faisal, N. F. (2026). Empowering strategic school management: Insights from system development of digital facility. In A. Iglesias, J. Shin, N. Bhatt, & A. Joshi (Eds.), *Information Systems for Intelligent Systems (ISBM 2025)* (Lecture Notes in Networks and Systems, Vol. 1744). Springer. https://doi.org/10.1007/978-3-032-12996-3_24

Rahim, M. M. A., Huda, M., Borham, A. H., Kasim, A. Y., & Othman, M. S. (2023, September). Managing information leadership for learning performance: an empirical study among public school educators. In *World Conference on Information Systems for Business Management* (pp. 75–91). Singapore: Springer Nature Singapore.

Rahman, M. H. A., & Huda, M. (2026). System development for virtual reality-based instruction: A comprehensive analysis. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1564). Springer. https://doi.org/10.1007/978-3-032-04581-2_14

Rahman, M. H. A., Jaafar, J., & Huda, M. (2023). Information and communication skills for higher learners competence model. In *Proceedings of the Computational Methods in Systems and Software* (pp. 357-375). Cham: Springer International Publishing.

Ran, H., Kasli, M., & Secada, W. G. (2021). A meta-analysis on computer technology intervention effects on

mathematics achievement for low-performing students in K-12 classrooms. *Journal of Educational Computing Research*, *59*(1), 119–153.

Razak, N. A., Jalil, H. A., Krauss, S. E., & Ahmad, N. A. (2018). Successful implementation of information and communication technology integration in Malaysian public schools: An activity systems analysis approach. *Studies in Educational Evaluation, 58*, 17–29. https://doi.org/10.1016/j.stueduc.2018.04.003

Riyanto, S., Prayitno, H. J., Huda, M., & Yuniawan, T. (2023). The Application of Moderate Politeness into School Practices of an Urban Muhammadiyah Primary Students in the Era of Global Communication. *International Journal of Language Education*, *7*(4), 729–747.

Rosin, N., Salleh, M. N. M., Jamil, A. I., Awel, H. R., Huda, M., & Isbahi, M. B. (2025). Embedding 21st century soft skills in Islamic higher education. *Nazhruna: Jurnal Pendidikan Islam, 8*(2), 318–335. https://doi.org/10.31538/nazhruna.v8i2.6410

Rosin, N., Salleh, M. N. M., Jamil, A. I., Awel, H. R., Huda, M., & Isbahi, M. B. (2025). Embedding 21st century soft skills in Islamic higher education. *Nazhruna: Jurnal Pendidikan Islam*, *8*(2), 318–335.

Saettler, P. (1990). The evolution of American educational technology. Englewood, CO: Libraries Unlimited.

Sahmat, M. S., Zamri, F. A., & Huda, M. (2025). Technology adoption for advancing learning quality performance: Insights into technology-assisted instructional design. In X. S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Tenth International Congress on Information and Communication Technology (ICICT 2025)* (Lecture Notes in Networks and Systems, Vol. 1412). Springer. https://doi.org/10.1007/978-981-96-6429-0_12

Sahmat, M. S., Zamri, F. A., & Huda, M. (2025, February). Technology adoption for advancing learning quality performance: insights into technology-assisted instructional design. In *International Congress on Information and Communication Technology* (pp. 141–149). Singapore: Springer Nature Singapore.

Serour, R. O. H., Abdelmaksoud, M. A., Musolin, M. H., Huda, M., & Kaspin, K. (2025a). Digital information system for knowledge acquisition: Insights from empirical literature analysis. In R. Silhavy & P. Silhavy (Eds.), *Research Perspectives on Software Engineering and Systems Design (CoMeSySo 2024)* (Lecture Notes in Networks and Systems, Vol. 1492). Springer. https://doi.org/10.1007/978-3-031-96775-7_29

Serour, R. O. H., Elsheikh, S. H. M., Musolin, M. H., & Huda, M. (2025b). Artificial intelligence-based medium of Islamic instruction design: An empirical literature review. In R. Silhavy & P. Silhavy (Eds.), *Research Perspectives on Software Engineering and Systems Design (CoMeSySo 2024)* (Lecture Notes in Networks and Systems, Vol. 1492). Springer. https://doi.org/10.1007/978-3-031-96775-7_31

Serour, R. O. H., Musolin, M. H., & Huda, M. (2026). Digital archive management system development in Islamic education: Critical review from recent literature. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1564). Springer. https://doi.org/10.1007/978-3-032-04581-2_20

Serour, R. O. H., Musolin, M. H., Abdelmaksoud, M. A., & Huda, M. (2025c). Virtual reality-oriented design for Islamic learning instruction: A critical review. In R. Silhavy & P. Silhavy (Eds.), *Research Perspectives on Software Engineering and Systems Design (CoMeSySo 2024)* (Lecture Notes in Networks and Systems, Vol. 1492). Springer. https://doi.org/10.1007/978-3-031-96775-7_30

Shabudin, S., Alwi, N. H., Atan, H., & Wong, S. L. (2008). Sikap guru sains terhadap penggunaan teknologi komputer di makmal sains. *Jurnal Teknologi*, 169–186.

Sharipah Ab Gani. (2017). *Kebaikan dan keburukan teknologi maklumat*. Universiti Malaysia Sabah.

Sihabudin, Mulyadi, D., Hananto, A. L., & Huda, M. (2026). Digital information system for education administration management direction: Empirical research from recent works. In R. Silhavy & P. Silhavy (Eds.), *Software Engineering: Emerging Trends and Practices in System Development (CSOC 2025)* (Lecture Notes in Networks and Systems, Vol. 1564). Springer. https://doi.org/10.1007/978-3-032-04581-2_9

Sivaram, M., Shanmugapriya, S., Yuvaraj, D., Porkodi, V., Akbari, A., Hashim, W., ... & Huda, M. (2020). Decision support system for determining academic advisor using simple additive weighting. In *Cognitive Informatics and Soft Computing: Proceeding of CISC 2019* (pp. 149–156). Singapore: Springer Singapore.

Stumbrienė, D., Jevsikova, T., & Kontvainė, V. (2024). Key factors influencing teachers' motivation to transfer technology-enabled educational innovation. *Education and Information Technologies, 29*(2), 1697–1731. https://doi.org/10.1007/s10639-023-11938-2

Sugiyarti, E., Jasmi, K. A., Basiron, B., Huda, M., Shankar, K., & Maseleno, A. (2018). Decision support system of scholarship grantee selection using data mining. *International Journal of Pure and Applied Mathematics*, *119*(15), 2239–2249.

Sugiyarti, S., Mukminan, M., & Sujarwo, S. (2024). Designing a Culture-Based Learning Model: A Qualitative Exploration for Strengthening Local Identity in Primary Education. *Jurnal Penelitian Ilmu Pendidikan*, *17*(2), 163–176.

Sugiyono. (2010). *Metode penelitian pendidikan pendekatan kuantitatif, kualitatif, dan R&D*. Alfabeta.

Sukadari, S., & Huda, M. (2021). Culture sustainability through Co-curricular learning program: learning Batik Cross Review. *Education Sciences*, *11*(11), 736.

Supramaniyam, V. (2015). *Penggunaan teknologi maklumat dan komunikasi (TMK) dalam kalangan guru-guru mata pelajaran kemahiran hidup di sekolah rendah luar bandar negeri Johor* [Doctoral dissertation, Universiti Tun Hussein Onn Malaysia].

Tabrani, Z. A., Walidin, W., Idris, S., & Huda, M. (2024). Pancasila as the core value for character building in Islamic higher education institutions. *Jurnal Ilmiah Peuradeun*, *12*(2), 565–592.

Taisin, J. N., Saufi, M. M. M., Kiting, R., Yusuf, R., Adam, N. F. M., & Huda, M. (2025). Artificial intelligence (AI)-supported gamification for learning performance: Insight into advancing learning intrinsic motivation. In X. S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Tenth International Congress on Information and Communication Technology (ICICT 2025)* (Lecture Notes in Networks and Systems, Vol. 1416). Springer. https://doi.org/10.1007/978-981-96-6441-2_1

Tan, A. A., Huda, M., Rohim, M. A., Hassan, T. R. R., Ismail, A., & Siregar, M. (2024, February). Chat GPT in supporting education instruction sector: an empirical literature review. In *International Congress on Information and Communication Technology* (pp. 13–26). Singapore: Springer Nature Singapore.

Thomas, S. L. (2000). Ties that bind: A social network approach to understanding student integration and persistence. *The journal of higher education*, *71*(5), 591–615.

Voogt, J., Erstad, O., Dede, C., & Mishra, P. (2013). Challenges to learning and schooling in the digital networked world of the 21st century. *Journal of Computer Assisted Learning, 29*(5), 403–413. https://doi.org/10.1111/jcal.12029

Wahid, A., Huda, M., Asrori, A., Abidin, R., Puspitasari, I., Hidayat, M. C., ... & Anwar, S. (2023, December). Digital technology for indigenous people's knowledge acquisition process: insights from empirical literature analysis. In *International Conference on Information and Communication Technology for Competitive Strategies* (pp. 41–57). Singapore: Springer Nature Singapore.

Wahid, A., Huda, M., Rohim, M. A., Ali, A. H., Kaspin, K. G., Fiqiyah, M., & Jima'ain, M. T. A. (2024, February). Augmented reality model in supporting instruction process: a critical review. In *International congress on information and communication technology* (pp. 69–83). Singapore: Springer Nature Singapore.

Yacob, S. (2013). *Digitalisasi sejarah – perkembangannya di Malaysia*. Jabatan Sejarah, Universiti Malaya.

Yaumi, M., & Damopolii, M. (2019). Model integrasi teknologi informasi dan komunikasi dalam pembelajaran jarak jauh. *Al-Musannif, 1*(2), 138–150. https://doi.org/10.56324/al-musannif.v1i2.21

Yusof, M., Mohd, N., & Tahir, Z. (2017). Kepentingan Penggunaan Media Sosial Teknologi Maklumat Dalam Pendidikan Ipta. *e-BANGI Journal*, *12*(3), 1.

Zainuri, A., & Huda, M. (2022). Understanding scientific literacy and pedagogy competence: a critical insight into religious integration thinking skills. *Journal of Educational and Social Research,*12(1), 273–281.

Zainuri, A., & Huda, M. (2023). Empowering cooperative teamwork for community service sustainability: insights from service learning. *Sustainability*, *15*(5), 4551.

Zamri, F. A., & Huda, M. (2025). Managing education institution administration system: Insights from digital technology advancement. In X. S. Yang, S. Sherratt, N. Dey, & A. Joshi (Eds.), *Proceedings of Tenth International Congress on Information and Communication Technology (ICICT 2025)* (Lecture Notes in Networks and Systems, Vol. 1416). Springer. https://doi.org/10.1007/978-981-96-6441-2_5

Zamri, F. A., & Huda, M. (2025, February). Managing education institution administration system: insights from digital technology advancement. In *International Congress on Information and Communication Technology* (pp.

37–45). Singapore: Springer Nature Singapore.

Zamri, F. A., Muhamad, N., & Huda, M. (2023). Information and communication technology skills for instruction performance: beliefs and experiences from public school educators. In *Proceedings of the Computational Methods in Systems and Software* (pp. 34–40). Cham: Springer Nature Switzerland.

Zamri, F. A., Muhamad, N., Huda, M., & Hashim, A. (2022). Social media adoption for digital learning innovation: insights into building learning support. In *International Conference on Information and Communication Technology for Competitive Strategies* (pp. 407–425). Singapore: Springer Nature Singapore.

Zuhri, H. H., & Huda, M. (2024). Enhancing Educational Ecosystems: Implementing Peter Senge's Learning Organization Model in Islamic Boarding Schools. *Munaddhomah: Jurnal Manajemen Pendidikan Islam*, *5*(2), 222–234.

**Author Statements**

*Acknowledgments*

We greatly appreciate the valuable contributions of research participants, faculty members and team members who took the time to participate in this study.

*Author Contributions*

Author contributions follow the CRediT (Contributor Roles Taxonomy). Use only the contributor roles applicable to this manuscript.

S.A.H. made a responsible task in preparing study design and revising.

M.H. made a responsible task for data collection and analysis.

ZAF drafted the manuscript and revised it.

All authors read and approved the final manuscript.

*Consent for Publication*

All authors have read and approved the published version of the manuscript.

*Funding*

This work was supported by research project number 2021–0052–107–01.

*Declaration of Competing Interest*

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

*Informed Consent*

Informed consent was obtained from all participants.

*Ethics Approval*

This article does not require ethical approval.

*Data Availability Statement*

All data generated or analyzed during this study are included in this published article.

*Use of Artificial Intelligence*

The authors declare that no generative artificial intelligence (AI) tools were used in the conception, design, analysis, interpretation, or writing of this manuscript.

*Supplementary Materials*

No supplementary materials are available.

**Journal Information**

*Ethics Statement*

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

*Preservation Policy*

This journal is archived by Library and Archives Canada (LAC).

*Open Access*

This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY 4.0). Please find details at https://creativecommons.org/licenses/by/4.0.

*Copyright © The Author(s)*

Copyright remains with the author(s). The author(s) grant the journal the right of first publication, and the article is published under the terms of the Creative Commons Attribution (CC BY 4.0) License.