# Systematic Literature Review of ICT Integration in Teaching and Learning

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***Abstract*** **– The integration of information and communication technology (ICT) in teaching and learning (T&L) has become a necessity as part of 21st century learning. However, the present literature shows that the level of ICT skills and usage among teachers is still low. Therefore, this systematic literature review (SLR) was conducted to examine the challenges in ICT integration in T&L and identify elements in integrating ICT. The articles for the SLR were obtained from the Web of Science (WoS) and Scopus databases. Out of the 103 articles extracted, only 14 were retained for the SLR based on the exclusion and inclusion criteria. All articles were published between 2017 and 2021. The articles reviewed highlighted that teachers face many challenges ranging from professionalism, expert teaching staff, lack of competency, constraints due to school regulation, cyber threats, limited facilities and access, as well as changes in teaching practices. The review also found three main elements in the integration of ICT in school which are teaching materials, digital learning work culture. These two findings imply that there are still gaps in research on the integration of ICT into T&L. In general, this SLR provides valuable information for teachers to help them diversify T&L practices.**

***Keywords*** **– ICT, integration in education, teaching and learning.**

DOI: 10.18421/TEM134-49
https://doi.org/10.18421/TEM134-49

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*Received: 27 March 2024.*
*Revised: 05 September 2024.*
*Accepted: 14 October 2024.*
*Published: 27 November 2024.*



## 1. Introduction

Education in Malaysia has transformed in tandem with modernization and development, leading to the integration of information and communication technology (ICT) across all educational levels, including universities, secondary schools, primary schools, and even preschools. ICT has become increasingly vital in educational development, aligning with 21st-century learning (PAK-21). As a progressively significant medium, ICT plays a crucial role in enhancing T&L today [1].

ICT is an essential component of teaching in the 21st century, as its use can effectively capture students' attention in the learning process [2]. Research on the use of ICT in early childhood education suggests that exposure to multimedia can enhance learning by making it faster and more efficient [1], [3]. Developing 21st-century skills is crucial for students, as these skills enable them to remain competitive in today's world. These skills are associated with various cross-curricular elements necessary in this technological era. Students should cultivate skills in communication, science and technology, critical thinking, as well as interpersonal and intrapersonal skills, in addition to foundational literacy and numeracy. Previous studies have demonstrated that 21st-century learning positively influences students' attitudes and motivation, leading to improved academic achievement [4].

In the contemporary technological era, the utilization of Information and Communication Technology (ICT) provides educators with the opportunity to diversify their instructional methodologies. The application of ICT not only enhances the effectiveness of the teaching and learning (T&L) process but also increases its engagement level. Therefore, fostering the integration of technology into T&L is both crucial and pertinent in the current educational landscape. As a result, the incorporation of ICT in teaching has emerged as a significant issue, attracting considerable interest from researchers seeking to explore this phenomenon.

However, teachers' limited proficiency with technology often results in the infrequent use of tech-based tools in their teaching. This lack of skills prevents the effective utilization of ICT resources provided by the Ministry of Education Malaysia in schools. Such a situation is particularly disadvantageous for 21st-century learners, who have diverse abilities and types of intelligence.

Previous studies have shown that ICT usage in the classroom remains low [5], [6]. Moreover, research indicates that teachers often have either low [7] or limited ICT skills [8]. Many teachers also continue to prefer teacher-centered approaches [9]. as evidenced by a substantial body of research on this topic. Given this, a SLR is needed to identify relevant studies and gain a deeper understanding of their findings. However, despite this need, there are few SLR papers on the topic, and those that exist have a limited scope. Numerous studies, such as [10], have examined the challenges teachers face when integrating technology into education.

Other studies [11]–[13] have explored the use of digital comics and animation as tools for learning. Additionally, research has shown that teachers often have a low level of understanding when it comes to ICT and digital literacy [14]. These points highlight the importance of conducting a systematic literature review (SLR) on the integration of ICT in teaching. An SLR is particularly valuable because it addresses the limitations of traditional reviews, such as a lack of transparency, potential writer's bias, selection bias, and publication bias. In this context, an SLR provides a comprehensive, transparent, and structured method for examining the literature.

### *1.1. Research Questions*

The SLR is based on two research questions, as follow;

(1) What are the challenges in integrating information and communication technology in teaching and learning?
(2) What are the elements in integrating information and communication technology in teaching in learning?

### *1.2. Research Objectives*

The main objectives of this SLR are:

(1) Examining the challenges in integrating information and communication technology in teaching and learning.
(2) Identifying the elements in integrating information and communication technology in teaching and learning.

### *1.3. Materials and Methods*

The PRISMA (Preferred Reporting Items for Systematic Review and Meta-Analysis) guidelines have been used as the primary reference for conducting this SLR. Originally developed as a publication standard for the fields of medicine and public health, PRISMA includes 27 items designed to guide researchers in systematically conducting SLRs [15]. Despite the focus of this SLR being in social science, PRISMA remains applicable as it helps researchers formulate clear research questions and conduct a more structured search process. Additionally, PRISMA reduces various forms of bias and supports researchers in performing a thorough research synthesis [16].

#### *1.3.1. Identification*

Identification in SLR involves selecting and diversifying keywords to locate relevant articles. Using keywords during the search process can help ensure that only the most suitable and relevant articles are retrieved from the database. Based on the research questions, three keywords were technology integration, T&L, and Jawi education. Synonyms, related words, and variants of the main keywords were included to broaden the search, identified using an online thesaurus, past studies, the Scopus database, and expert opinion. The result of the identification process is shown in Table 1.

The article search was conducted in the Web of Science and Scopus databases, chosen for their advantages. First, according to [17], databases such as Web of Science (WoS) and Scopus offer more comprehensive and stable search results with advanced features compared to other databases. In addition, WoS and Scopus excel in article quality control and systematic indexing [18].

Advanced search techniques, including Boolean operators (AND, OR), phrase searching, truncation, wildcards, and field codes, were used to search for articles in both the Web of Science (WoS) and Scopus databases (see Table 1). This search strategy resulted in the identification of 93 articles from Scopus and 10 articles from WoS that were relevant to the keywords. In the second stage of the systematic search process, all identified articles were thoroughly screened.

*Table 1. Search string for searching database articles*

| Database | Search String |
|---|---|
| Web of Science (n=93) | TS= (("learn*" OR "coach*" OR "train*" OR "guidance" OR "tutor*" OR "methods" OR "teaching") AND ("technology" OR "digital learning" OR "integration of technology" OR "internet learning" OR "ICT") AND ("secondary" OR "high school") AND ("Jawi education" OR "hijaiyah" OR "Islamic Education")) |
| Scopus (n=10) | TITLE-ABS-KEY (("learn*" OR "coach*" OR "train*" OR "guidance" OR "tutor*" OR "methods" OR "teaching") AND ("technology" OR "digital learning" OR "integration of technology" OR "internet learning" OR "ICT") AND ("secondary" OR "high school") AND ("Jawi education" OR "hijaiyah" OR "Islamic Education")) |

*: Search String.

### *1.3.2. Screening*

Through the screening process, a total of 101 articles were successfully identified. Screening involves setting inclusion or exclusion criteria for the research. These criteria determine the articles' suitability for the SLR [19]. The first inclusion criterion is the year of publication. Only articles published in the last five years (2017 to 2021) for this SLR were selected. This aligns with the concept of study maturity discussed in [20]. In this context, numerous relevant articles published during this period were successfully identified. The subsequent inclusion criterion focuses on quality; therefore, this systematic literature review (SLR) exclusively includes journal articles. To facilitate the reading and analysis process, only articles published in English were selected, ensuring accurate comprehension and interpretation of their content. Additionally, only articles containing relevant empirical data were included, excluding review articles, as the objective of this SLR is to analyze findings from previous studies rather than reviews.

Furthermore, another criterion required that the selected articles specifically address the integration of ICT.

Subsequently, articles irrelevant to the research objectives were rejected to ensure relevance to the SLR's focus (Table 2). After screening, 61 articles were rejected for not meeting the criteria, leaving 40 articles for further analysis.

*Table 2. The inclusion criteria*

| | Inclusion Criteria |
|---|---|
| Year of Publication | Within the past 5 years (2017 to 2021) |
| Type of Publication | Journal Article |
| Language | English |
| Type of Finding | Empirical Finding |
| Focus of Finding | Data related to the integration of ICT in T&L. |

### *1.3.3. Eligibility*

The next step is to assess the eligibility of the 40 articles identified during the initial screening. This eligibility assessment involves a second round of screening to ensure the accuracy and relevance of each article for inclusion in the systematic literature review (SLR). All selected articles will be carefully evaluated during this stage to verify their suitability and relevance for the SLR.

This process begins with reviewing each article's title and abstract to assess its relevance. If the relevance is unclear from these sections, a more detailed examination of the methodology, results, and discussion sections is performed. Through this process, 21 articles were excluded because they addressed topics outside the scope of ICT integration in teaching and learning, focusing instead on fields like health, science, and mathematics. As a result, 19 articles were retained for further quality assessment Refer to Figure 1).

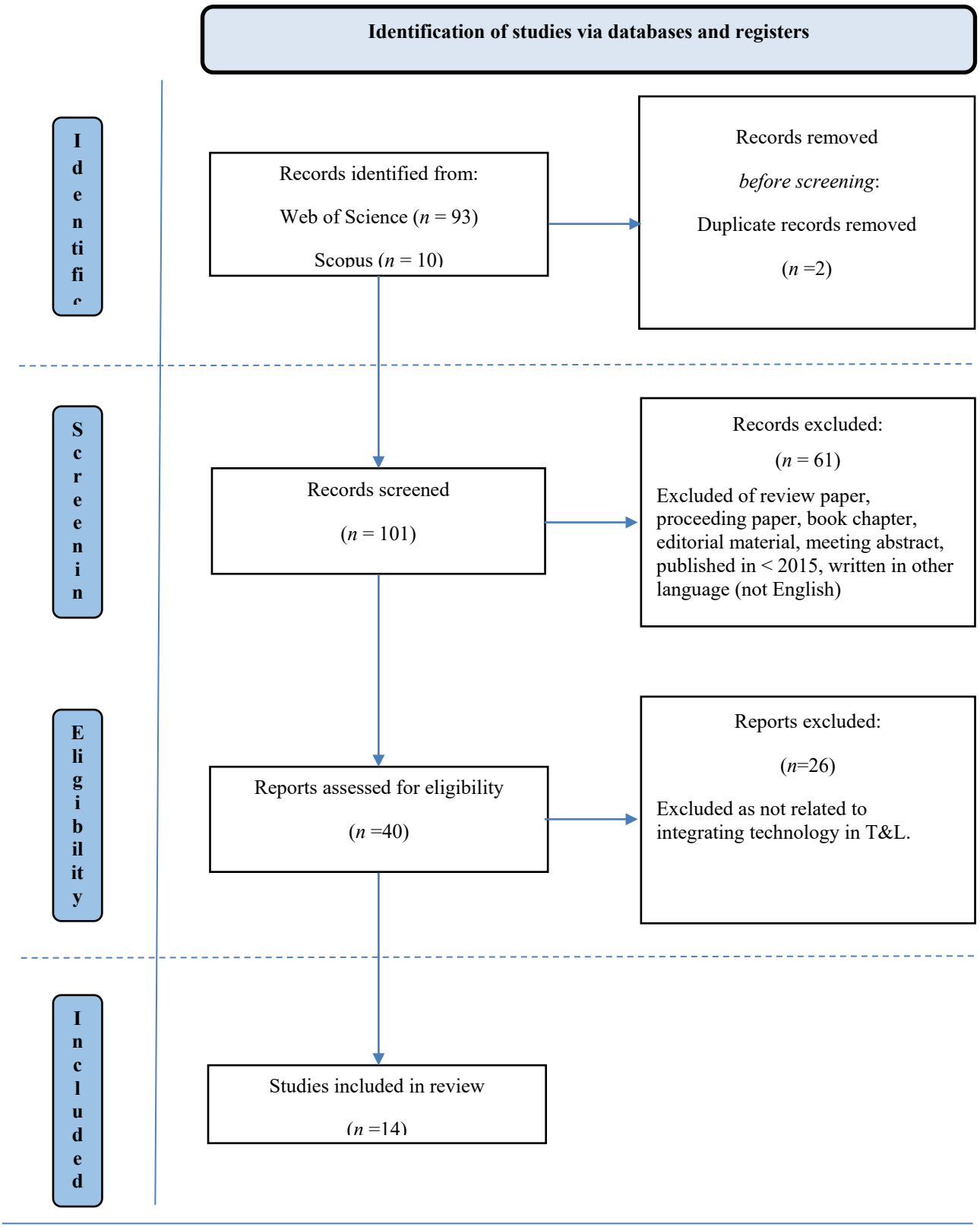


*Figure 1. Flow diagram of the SLR*
*Source: adapted from [56]*

### *1.3.4. Article Quality Assessment*

The selected articles then went through a rigorous quality assessment process, which is essential for reducing bias and identifying any methodological limitations [21]. This evaluation was carried out by two members of the research team. Since the SLR includes studies from various designs—quantitative, qualitative, and mixed methods—the assessors used the Mixed Methods Appraisal Tool (MMAT) to guide the evaluation [22]. Each article was assessed against two fundamental criteria, along with five additional criteria specific to its research design.

The initial phase of this process involved evaluating each article's quality based on two fundamental criteria: 'Are the research questions clearly stated?' and 'Can the data obtained answer the research questions?' Articles had to meet both criteria before advancing to the next stage, where they were categorized by study design (qualitative, quantitative, or mixed methods). Subsequently, the articles were assessed against five specific criteria. For each criterion, the assessors could choose from three options: Yes, No, or Cannot tell, if the evaluation results were uncertain or unclear. The three assessors needed to reach a consensus on each article's assessment. If they could not agree, a second opinion was required. Of the 19 articles evaluated, 14 met at least three of the five criteria necessary for inclusion in the SLR, while 5 did not and were excluded as they failed to meet the minimum standards [23]–[27] Tables 3, 4, and 5 provide the assessment criteria results for the rejected articles. .

*Table 3. Quantitative article quality evaluation results (rejected article)*

| **Basic Criteria/ Research** | [24] |
|---|---|
| Are the research questions clearly stated? | N |
| Did the obtained data answer the research questions? | N |
| *Qualitative Criteria* | |
| Did the study use the qualitative approach appropriately to answer the research question? | Y |
| Is the qualitative data collection methodology sufficient to answer the research questions? | N |
| Are the results obtained from the data sufficient? | N |
| Did the data substantiate the result interpretations? | N |
| Is there continuity between the source, collection, analysis and interpretation of qualitative data? | N |
| Result | Rejected |

*Table 4. Qualitative article quality evaluation results (Rejected Article)*

| **Basic Criteria/ Research** | [27] | [26] | [23] |
|---|---|---|---|
| Are the research questions clearly stated? | Y | Y | Y |
| Did the obtained data answer the research questions? | Y | Y | Y |
| *Quantitative Criteria* | | | |
| Is the sampling strategy used relevant to answer the research question? | Y | N | Y |
| Is the selected sample representative of the population studied? | Y | N | Y |
| Did the study use the appropriate measurements? | Y | Y | Y |
| Is there a low risk of biased nonresponse? | C | C | C |
| Did the study use appropriate statistical analysis to answer the research question? | Y | Y | Y |
| Result | Rejected | Rejected | Rejected |

*Table 5. Mixed-method article quality evaluation results (Rejected Article)*

| **Basic Criteria / Research** | [25] |
|---|---|
| Are the research questions clearly stated? | Y |
| Did the obtained data answer the research questions stated? | Y |
| *Mixed-Method Criteria* | |
| Is there a reason to use mixed methods to answer research questions? | C |
| Did the study combine different study components effectively to answer the research questions? | Y |
| Did the study interpret the combined qualitative and quantitative results accurately? | Y |
| Did the study address the differences and elements of inconsistency between the quantitative and qualitative results? | C |
| Did the different study components comply with the quality criteria for each study design involved? | Y |
| Result | Rejected |

### *1.3.5. Data Extraction and Analysis*

The next step in the process is data extraction from each selected article, which is carried out by two researchers. The primary goal of this SLR is to review past research on the integration of ICT in teaching and learning practices.

Therefore, the data extraction focuses specifically on three main sections: the abstract, research

findings, and discussion. Nevertheless, all articles were thoroughly read to gain a comprehensive understanding of the topics covered.

The extracted data were organized into a table to facilitate the analysis process, which began once all data had been collected. Since this SLR utilizes an integrative review approach that includes multiple study designs (quantitative, qualitative, and mixed-methods), qualitative synthesis was chosen as the most appropriate method of analysis [28]. In this context, various analytical techniques, such as thematic analysis, can be applied for qualitative synthesis. As noted by [29], thematic analysis aims to identify patterns in past studies based on similarities or the relevance of their findings.

The extracted findings were individually reviewed to identify relevant themes. Findings with similar or related content were grouped into a single data set. These clusters were then assigned appropriate themes. Two experts in SLR and T&L validated the identified themes. Both experts agreed that the main categories and themes were suitable and relevant to the research questions (Table 6).

*Table 6. Classification of study design, categories, and themes*

| Research | | Teacher | | | Student |
|---|---|---|---|---|---|
| | **Design/ Theme** | **Challenge** | **Teaching Materials** | **Work Culture** | **Digital Learning** |
| [34] | MX | / | / | | |
| [35] | MX | / | / | | |
| [30] | QL | / | | / | |
| [36] | MX | | / | | |
| [37] | QN | | | | / |
| [33] | QN | / | | | |
| [31] | QL | / | | / | |
| [38] | QN | / | | | / |
| [32] | MX | / | | | / |
| [43] | QN | | | | / |
| [39] | QN | | | | / |
| [40] | MX | | | | / |
| [41] | QN | / | | | / |
| [42] | QN | | | | / |

*QN-Quantitative QL-Qualitative MX-Mixed Methods*

## 2. Results

Before moving on to the next section, this part provides an overview of the publication dates for the articles included in the SLR. Of the 14 articles selected, five were published in 2021, two in 2020, three in 2019, three in 2018, and two in 2017.

Additionally, 12 articles were sourced from Web of Science (WoS) journals, while the remaining two were from Scopus journals.

The researcher also analyzed each article to identify their main focus and to extract the challenges associated with integrating ICT into T&L. Table 7 lists the findings based on RQ1.

*RQ1: What are the challenges of integrating information and communication technology in teaching and learning?*

*Table 7. Challenges in integrating information and communication technology in teaching and learning*

| **Challenges/ Article Number** |
|---|
| Professionalism [30] |
| Expert teaching staff [31] |
| Lack of competency [33] |
| Main challenges [33] |
| Effective Technology [31] |
| 31.9% of teachers use mobile devices for learning [32] |
| Prohibition of using mobile devices in schools [32] |
| Limited Facilities [34] |
| Inadequate Facilities [32] |
| Limited Access[32] |
| Changes in teaching practices [32] |
| Learning Disruption in class [32] |
| Modern Technology Learning Barriers [31] |
| Cyberbully, sexting and fraud [32] |

The review revealed that teachers face numerous challenges when integrating technology and information communication in their teaching. A study [30] found that although the teaching staff at Madrasah Tsanawiyyah exhibit high levels of professionalism, they are not up to date with the latest educational advancements and continue to rely on conventional teaching methods. This situation is further compounded by a lack of technological expertise, resulting in limited knowledge of modern digital tools. Consequently, teachers' use of ICT is confined to only the most basic tools in the classroom [30].

A study [31] in Somalia revealed that public schools are still lagging in the effective use of technology. As education evolves, it is crucial for teachers to be open and adaptable to changes in teaching practices [30], [32] to foster a competent and competitive generation. The findings indicate that only 31.9% of teachers use their mobile devices for T&L in the classroom, while the rest use them for non-teaching purposes. To fully benefit from the advancements in education, teachers need to shift their perception that mobile devices are a distraction in the classroom [31], [32] This shift will allow both teachers and students to take full advantage of modern educational technologies.

Next, technology literacy among teachers is crucial for developing expert teaching staff [31]. as it ensures they can effectively integrate technology into T&L.

However, studies have found that low technological competency among teachers remains a significant barrier to effective classroom instruction [33] Additionally, the limited availability of learning resources [34] and inadequate facilities [32], especially restricted internet access in schools, further hinder the successful implementation of technology-based T&L

There is no doubt that the uncontrolled use of technological facilities can have negative impacts on users. The risks of cyberbullying, sexting, and fraud present significant challenges for teachers in schools [32]. Due to these threats, many schools have opted to ban students from using mobile devices for classroom learning, which indirectly restricts teachers' ability to diversify their teaching strategies. To ensure mobile devices can be effectively used for educational purposes, strict control and supervision are necessary.

*RQ2: What are the elements of integrating Information and Communication Technology in teaching and learning.*

The SLR shows the integration of ICT in T&L can be categorized into three elements, namely (1) teaching materials, (2) digital learning and (3) work culture. Tables 8, 9, and 10 below summarize the findings of the articles reviewed.

### *2.1. Teaching Material Elements*

Table 8 shows the ICT integration elements emphasized in the review article.

The use of teaching aids can enhance students' understanding of a subject. For instance, [34] examined the effectiveness of the ELTIS Resources Pack, which includes various supplementary materials such as the Listening Resource Pack, Islamic Resource Pack, Games and Graphics Resources Pack, and Assessment Resource Pack. These resources help address the challenges of teaching large classes with over 45 students by providing comprehensive teacher guides that can be referenced during lessons. Additionally, using interactive materials like Civicpedia, which features components such as a homepage, dictionary, media, quizzes, and contact sections, can enhance creativity and increase student motivation [35]. These resources offer a structured alternative to facilitate digital learning effectively. Moreover, e-learning applications like Edmodo and WordPress provide valuable platforms for teachers to develop skills in designing e-gamification activities [36].

However, due to various constraints, teachers in schools like Madrasah Thanawiyah in Indonesia continue to rely on traditional teaching methods [30].

A similar situation is observed in public schools in Somalia, where basic teaching resources such as chalk, blackboards, and textbooks remain prevalent. Secondary schools in Somalia are provided with additional teaching aids, such as projectors and computers, but these are primarily used for practical lessons [31].

*Table 8. Teaching materials element*

| **Teaching Materials** |
|---|
| Additional materials for Islamic Primary Schools to cater for large classes [34] |
| Teaching materials are formulated contextually for real-life and critical thinking [35] |
| Gamification & social and personal e-learning [36] |
| Effective teaching materials [31] |
| Conventional teaching methods [30] |

### *2.2. Digital Learning Elements*

Table 9 shows the elements of digital learning discussed in articles studies reviewed.

The findings on digital learning elements revealed both positive and negative effects of technology use in education. Students expressed strong acceptance of digital technology for learning, reflecting their beliefs and attitudes toward its benefits [37]. Additionally, the results indicate that factors such as digital literacy, the quality of educational content, and adequate training significantly shape students' attitudes and perspectives. [37].

Moreover, problem-based learning (PBL) enables students to come together to explore and discuss common issues, fostering a positive virtual learning environment [38] This approach allows for dynamic exchanges between students from diverse socio-cultural backgrounds, making learning more enjoyable and engaging. It also provides students with opportunities to connect with peers from different locations, encouraging them to learn collaboratively and share their perspectives. Additionally, another study [39] investigated the integration of the Collaborative Creativity Learning (CCL) model with PhET simulations in science lessons and found that this approach significantly enhances students' creativity.

Furthermore, a study on innovations in digital learning, including flipped classroom-based weblogs, demonstrated that such approaches can enhance student achievement [40]. Digital learning has also been positively embraced as a solution to school closures during the COVID-19 pandemic [41]. with many students successfully using these tools for online mathematics education.

Additionally, teachers strongly encourage the use of scientific inquiry through ICT integration, emphasizing the importance of behavioral factors [42].

However, several studies have highlighted the negative effects of over-reliance on digital learning. Excessive use of digital platforms can lead to a lack of control and increased exposure to risks such as cyberbullying, sexting, and online fraud [32]. Young children, particularly preschoolers, are at risk of sleep deprivation and behavioral problems due to prolonged use of digital devices like tablets [43]. Many of these children spend over 3-5 hours per day on screens, often watching movies or playing games.

*Table 9. Digital learning elements*

| Digital Learning |
|---|
| Acceptance of digital technology [37] |
| Digital knowledge, digital education content and digital training [37] |
| Problem-Based Learning (PBL) in virtual exchange provides a positive experience [38] |
| Collaborative Creativity Learning (CCL) enhances student creativity [39] |
| Flipped classroom-based weblogs effectively improve student achievement [40] |
| Digital learning responds positively [41] |
| Scientific inquiry through the integration of ICT (Behavioral Factors) is encouraged by teachers in schools [42] |
| Cyberbullying, sexting and fraud [32] |
| Negative effects on sleep quality and behaviour [43] |

### *2.3. Work Culture Elements*

Table 10 demonstrates the work culture elements identified in articles on ICT integration during T&L.

Various aspects of work culture have been identified in the literature as critical to the effective integration of ICT in teaching and learning (T&L) practices. Integrity is demonstrated by teachers' commitment to performing their tasks to the best of their abilities and their refusal to engage in bribery [30]. However, some teachers struggle with time management, such as not arriving in the classroom on time or leaving school early. Additionally, teachers' professionalism [30] is evident in their work performance, efficiency, and diligence, as well as in their ability to meet set targets.

They are rewarded based on their qualifications and held accountable when they deviate from expected standards.

In many countries, the majority of teachers possess a bachelor's or master's degree and undergo several years of teacher training. Yet, some teachers exhibit lower motivation to enhance their skills. This results in the lack of innovation implementation [30].

This scenario is supported by a study [31] that highlighted the selection of professional teaching staff based on the criteria of (1) teachers' expertise and (2) experience in the subject taught. Regarding responsibility, teachers could complete assignments on time, make initial preparations for teaching, and quickly solve problems faced by the students, parents, and peers [30]. However, numerous experienced educators demonstrate reduced dedication to their roles and obligations. Overall, the teachers in Madrasah Thanawiyah show admirable attitudes that can be emulated by students and the school community [30].

To maintain high standards, some public secondary schools in Somalia control the admission of students into their programs [31]. These schools have established strict admission criteria, accepting only students who have completed primary school or those transferring from secondary schools of a similar level. In some cases, transfer students must pass an admission assessment test to ensure that only the most capable and qualified students are enrolled. Additionally, the findings indicate that students at these schools actively engage in the classroom learning process. The schools also encourage the use of modern technology to enhance learning outcomes and adhere strictly to the country's official curriculum [31]. The overall findings are summarized in Table 11.

*Table 10. Work culture elements*

| Work Culture |
|---|
| Integrity, professionalism, innovation, responsibility and being exemplary [30] |
| Strict admission process, formal curriculum, expert teaching staff, actively participating, effective technology [31] |

*Table 11. Summary of findings of the 14 articles selected for the SLR*

| No | Study | Aim | Method /Sampling | Findings |
|---|---|---|---|---|
| 1 | [29] | Needs Analysis for additional materials designed for Islamic primary schools with limited facilities to cater to large classes of up to 45 students and provide guidance for teachers. | Research and development (R&D) design, questionnaires involving 187 English Teachers in East Java and 193 English Teachers in West Nusa Nusantara.<br><br>Interviews with 10 Principals, 15 English Teachers and 25 pupils. | Additional materials for Islamic primary schools should the needs of meet large classes |
| 2 | [35]. | Designing and developing civicpedia as an e-learning platform for civic education to improve information literacy among students. Ogos 2023o | This study employed both qualitative and quantitative approaches with research and development design. The participants comprised 447 students | The students showed positive responses to the implementation of civicpedia in learning to improve information literacy. |
| 3 | [30] | Examining the work culture (integrity, professionalism, innovation, responsibility and example) of Teachers in Madrasah Tsanawiyah (Lampung Province) | The study used the descriptive qualitative method. Data were collected through observations, in-depth interviews, and Focus Group Discussions (FGDs). | The work culture in Madrasah Tsanawiyah in Lampung province is guided by five values: integrity, professionalism, innovation, responsibility, and dignity. |
| 4 | [36] | This study aims to identify the effectiveness of both the Edmodo social E-learning environment and the personalised WordPress e-learning environment in developing teacher technology skills in designing activities based on gamification. | The study used the quantitative and qualitative approaches, specifically the quasi-experimental approach, on two randomly selected experimental groups.<br><br>Each group consists of 30 Information Technology in secondary schools | The findings show the effectiveness of Edmodo's E-learning social environment. WordPress's customised E-learning environment can be used to design E-activities based on gamification for learning. |
| 5 | [37] | This study aims to study the impact of ICT and digital knowledge on students' thoughts and beliefs. | Questionnaires were distributed to 384 high school students in Iran | The adoption of digital technology positively affects students' thoughts and beliefs. |
| 6 | [33] | Investigating the attitude of Iranian high school EFL teachers towards efficiency, and their actual use of teaching technology in the classroom | The study involved 1,120 English as a second language (EFL) teachers.<br><br>More than 600 primary and secondary school students answered the Student Questionnaire. | Iranian teachers are positive about technology (computers). However, they are not efficient enough to use it in class |

| | | | | |
|---|---|---|---|---|
| 7 | [31] | Examining the practices of the nine best high school principals in the Southern and Central Region of Somalia | This study adopted the qualitative research design, specifically the descriptive phenomenology research design.<br>The study comprises a structured open interview protocol that contains eight interview questions conducted with nine school principals. | Quality of education is maintained through the strict admission process, efficient curriculum, effective instruction, quality teaching materials, professional teaching staff, and active learning. |
| 8 | [38] | The purpose of this study is to help students formulate useful cell structure analogies, analyze how imperfect analogies represent the target concept and work with others to increase their knowledge of cell structure and learn about other cultures. | The sample consists of two students from an American school and two from an Egyptian school. | Virtual exchange in Problem-Based Learning (PBL) provides a positive experience. It does not require high material costs and can be realized to enhance international relations. |
| 9 | [32] | This study aims to determine the extent to which math teachers use their own mobile devices either in their daily activities or at school. | This study employed both quantitative and qualitative methods.<br>It was conducted in Indonesian schools and involved 213 teachers. | most teachers use mobile devices to communicate and collaborate with other teachers.<br>Only 31.9% of teachers use mobile devices in T&L activities. |
| 10 | [43] | Investigate the impact of digital device use on preschoolers' behavioural and sleep scores in Saudi Arabia (SA). | The cross-sectional study was conducted in two regions of Saudi Arabia.<br>Researchers used interviewed parents of 1.5-5-year-olds who use technology for any purpose. | Significant negative effects of screen time viewing on children's sleep quality and behavioral indicators. |
| 11 | [39] | The study highlights the evaluation of the practicality and effectiveness of integrating the CCL model with the PhET simulation model | This study used the experimental research design.<br>The sample comprised 144 primary school students. | CCL (Collaborative Creativity Learning) model integrated with PhET can be used to enhance pupils' creativity. |
| 12 | [40] | Exploring the efficacy of utilizing a weblog-based flipped classroom approach in civic education instruction. | This study combined qualitative and quantitative approaches.<br>The participants consisted of 42 students | The results indicated the practicality of integrating a weblog-based flipped classroom model for civics education. |
| 13 | [41] | The study seeks prompt feedback from Palestinian students regarding their participation in mathematics learning activities across diverse digital platforms. | This study employed the cross-sectional study design.<br>3179 primary and secondary school students from Gaza. | The use of digital learning is deemed as a positive response to schools closure during the COVID-19 pandemic. |
| 14 | [42] | This study aims to ensure valid items were identified to measure attitude aspects, namely affect, behaviour and cognitive. | Samples from three secondary schools were selected<br>350 students responded to the self-constructed questionnaires. | The results indicate that teachers actively promote scientific inquiries facilitated by ICT integration (Behavioral Factors). |

## 3. Discussion

The literature review highlighted both the challenges teachers face in integrating ICT into teaching and learning (T&L) and the critical elements necessary for successful integration. Many teachers struggle to incorporate ICT into their teaching practices in order to keep pace with current developments.

From a technological perspective, research indicates that in developing countries, teachers' technological knowledge and awareness remain low compared to those in developed countries [30], [31], [33]. This lack of exposure to technology-related skills results in limited use of technology in the classroom, often leading to the use of only basic technological tools [30].

Teachers find it challenging to alter their teaching practices [32] and continue to rely on traditional methods due to insufficient knowledge, training, and support for adopting new approaches.

Studies have also identified several barriers to the integration of ICT in T&L, including limited infrastructure, restricted access, and inadequate facilities [32], [34]. Despite teachers and students being ready and open to educational advancements [30], [32] these limitations have hindered teachers' ability to incorporate innovative approaches in T&L. As a result, the learning process can become monotonous and less engaging, as noted in [2]. Although ICT has the potential to enhance student engagement, the findings reveal a persistent shortage of infrastructure and internet coverage, particularly in rural areas [10].

The reviewed articles also presented challenges related to teacher literacy. It found that many teachers do not master technology skills [44]. The literature review underscored the importance of enhancing teacher literacy [31]. A similar notion was echoed in [10]. This situation emphasizes the need for teachers to creatively and innovatively strengthen their blended learning practices through digital technology. To address this issue, teachers should participate in both in-house courses and online training. Additionally, both parents and educators need to undergo a paradigm shift to gain proficiency in contemporary technology [10].

The overuse of technology can lead to various health issues. Previous research has highlighted concerns about the impact of time spent on technology devices and social media at home and school on health and development [45]. Exposure to devices has been associated with health problems such as shortsightedness, obesity, and irregular sleep patterns [46].

Additionally, some children exhibit aggressive behaviors, such as shouting when losing a game, and may show antisocial behavior, including limited social interaction with family and peers, as well as time wasted on the Internet and online games. Game addiction can result in procrastination, excessive spending on game upgrades, and declining academic performance. The overuse of technology can be harmful to the students and leads to s physical development and health problems due to improper posture when using gadgets like smartphones excessively [47]. In this context, students undergoing critical developmental phases, such as identity formation and relationship building, are significantly influenced by the digital era [48].

Textbooks and paper-based questions and notes are gradually being replaced with digital versions. Therefore, the impact of using ICT-based teaching materials instead of traditional ones should not be underestimated.

The literature review indicates that additional teaching materials, such as civicpedia and e-learning applications, have a positive impact on students' education [39]–[41]. This finding is in line with [49], which highlights the benefits of using videos in the classroom to enhance students' comprehension, motivation, and overall learning experience. Videos contribute to increased reading engagement, knowledge acquisition, and teaching efficacy. A study on tahfiz schools revealed that incorporating audio-visual materials from platforms like PowToon, Panopto, and YouTube improved the effectiveness and engagement of teaching and learning in tahfiz studies. Thus, the use of videos aligns with students' current developmental and learning needs, potentially contributing to the development of a quality generation [50].

The next focus is on the elements of digital learning. Overall, digital learning has received positive feedback from students. Literature reviews indicate that students have favorable attitudes towards using Minecraft in digital game-based learning, viewing it as beneficial for improving their academic performance compared to traditional methods [51]. Additionally, incorporating animation into digital learning has made learning active, creative, effective, and pleasant [5]. There is also a significant link between the ease of technology, motivation, and student awareness of digital learning [13]. Another research study suggested that incorporating e-books and digital comics into education enhances students' learning outcomes [11]. The use of animation in learning also makes learning active, creative, effective and enjoyable [34].

In addition, the use of video-sharing platforms like Youtube as teaching materials has also improved students' achievement [52].

Teachers' resilience, integrity, and accountability significantly influence the success of digitalization efforts at the school level. Even with advanced ICT facilities, the impact is limited without teachers' enthusiasm. Teachers' integrity, professionalism, innovation, responsibility, and transparency can enhance the quality of technology-assisted teaching [30]. Additionally, improving professional competency and leveraging technology are crucial for advancing teachers' knowledge and professionalism [53]. A study has found that teachers in SMK Teknologi Bojonegoro demonstrate a positive work environment and high spirit, competence and performance [54].

Lastly, selecting master teachers [31] in technology could facilitate the teaching process. A study [55] found that preschool teachers exhibit advanced technology skills, underscoring the importance of integrating technology into preschool education. Therefore, educators must be adequately equipped to provide a T&L environment that meets the demands of the 21st century.

## 4. Recommendation

Future research on ICT integration in teaching and learning should broaden its scope to align with the evolving landscape of our nation's educational system. Studies could explore diverse topics, including the factors that influence ICT practices in teaching and learning. Additionally, future research might investigate issues related to the integration of ICT in learning, aiming to expose teachers and the community to the latest developments in this area. Another avenue for exploration could be the teaching practices of teachers in rural schools, focusing on the challenges and strategies for ICT integration in these settings.

This research is crucial in enhancing our understanding of how ICT can be effectively incorporated into learning environments. The systematic literature review (SLR) provides valuable guidelines and references for stakeholders, particularly educators, to diversify teaching methods in the classroom. Furthermore, this SLR could expand the existing body of knowledge, benefiting researchers by providing new insights and directions for future studies.

## 5. Conclusion

This systematic literature review (SLR) aims to analyze the obstacles encountered when incorporating ICT into teaching and learning (T&L) processes. Additionally, it explores the key components essential for the successful integration of ICT into T&L practices. The analysis of 14 articles selected for the review reveals that the use of information technology in T&L is a necessity rather than an option. Digital platforms can make teaching easier, more engaging, and less burdensome. However, some teachers and students still overlook digital learning due to a lack of knowledge, which leads them to perceive it as difficult and burdensome. Furthermore, some schools have yet to embrace technological advancements and continue to restrict the use of mobile devices by students. The findings of this SLR highlight that challenges and constraints in integrating ICT into T&L remain prevalent.

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