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Exploring the Impact of Sustainable Practices on Educational Environments: AComprehensive Review

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Abstract:

The rapid expansion of Information and Communication Technologies (ICTs) has revolutionizedstudents into digital learners, prompting educators to incorporate technology into their teaching methods. In this context, teachers' attitudes, technological expertise, and skills play a crucial role in ensuring effective integration. This study explores teachers' perspectives on technology integration in teaching and learning across all educational levels in India, drawing on recent research conducted in the past five years.The results indicate that teachers generally hold positive views on integrating technology into their teaching practices. They believe that incorporating technology enhances their instructional methods, making the learning experience more engaging and interactive, thus keeping students motivated. However, the study also identifies several obstacles, including slow internet speed, power outages, insufficient infrastructure, limited onlineteaching experience, and inadequate training, hindering effective ICT integration in teaching.

In light of these findings, it is recommended that relevant authorities establish clear and effectivepolicies to maximize ICT utilization. This includes allocating adequate budgets and ensuring essential facilities such as ICT infrastructure, tools, software, internet access, and laboratories in all educational institutions. Additionally, there should be a focus on providing opportunities for teachers' career development, specifically in acquiring technological competencies, to enable successful integration of ICT into their instructional practices.

Keywords: Technology integration, Teachers' perceptions, Teaching-learning practices, online teaching challenges, Online learning, Systematic review

Introduction:

Information and communication technology (ICT) holds a pivotal role in contemporary society, exerting significant influence across various aspects of human life (Gnambs, 2021). In the realm of education, ICT has undergone a transformative process, revolutionizing instructional methods to become more engaging and effective (Lin et al., 2017). Through the provision of diverse tools usable in both traditional and online educational settings, ICT fosters an interactive classroom environment and supports proactive teaching practices (Jogezai et al., 2021).

The integration of technology into instructional strategies not only enhances teaching quality (Akram et al., 2021a) but also empowers students to enhance their skills, motivation, and knowledge acquisition more efficiently (Chen et al., 2018). Amid the global crisis precipitated by COVID-19, where conventional activities faced restrictions, ICT played a crucial role in sustaining teaching and learning endeavors (Thaheem et al., 2021). Additionally, ICT- integrated educational approaches offered flexibility and broader access to learning opportunities, serving as a viable alternative to traditional face-to-face instruction (Akram et al.,2021b).

Despite challenges stemming from teachers' insufficient technological competencies, the transitional period prompted an improvement in their digital skills. Moreover, the utilization of ICT in education to enhance instructional effectiveness has been recognized as vital globally in recent decades (U.S. Department of Education, 2017). Numerous studies emphasize the significance of ICT-integrated instructional methods in meeting learners' educational needs, fostering critical thinking, and sustaining student motivation—a crucial factor in educational advancement (Xu et al., 2021). Liu et al. (2022) further highlight that technology-integrated learning enhances students' cognitive understanding and learning outcomes.

Furthermore, ICT-incorporated teaching practices facilitate ongoing interaction between learners, instructors, and peers through various social media platforms. This connectivity aids in addressing academic challenges and promoting active participation in learning activities (Liu Z. et al., 2021). Recognizing the importance of fostering a collaborative classroom environment, Liu S. et al. (2021) propose designing collaborative activities using the computer-supported collaborative concept mapping (CSCCM) technique, which also enhances student engagement.

In summary, ICT-integrated teaching and learning have become indispensable in fulfilling learners' educational needs and assisting teachers in aligning their pedagogical approaches with global standards.

India has acknowledged the significance of integrating ICT into education, evident in itsnational educational policies, reflecting the government's commitment to meeting global educational standards (India Ministry of Education, 2018). However, several challenges hinder the successful implementation of ICT in classrooms in developing countries like India. These challenges include inadequate ICT infrastructure (Akram et al., 2021a), unreliable electricity and internet connectivity (Akram et al., 2021b), limited technological knowledge and expertise among educators (Asad et al., 2020), and insufficient teacher training in educational institutions(Abbasi et al., 2021).

In addition to these technology-related obstacles, teachers' personal perceptions and beliefs significantly influence the effective integration of technology. Teachers' beliefs shape their pedagogical decisions regarding how to incorporate technology into instructional practices to meet the demands of 21st-century teaching and learning (Tondeur et al., 2017). Previous research has shown that teachers' instructional methods are strongly influenced by their pedagogical beliefs (Taimalu and Luik, 2019). Teachers tend to prefer technological tools that align with their teaching strategies and existing beliefs about teaching and learning. Essentially, teachers' perspectives on teaching and learning dynamics in the classroom are closely linked to their use of technology.

In light of this, innovative educational approaches emphasize the importance of considering teachers' perspectives on technology use for effective integration (Watson and Rockinson- Szapkiw, 2021). Accordingly, this study aims to explore teachers' perceptions of the benefits, willingness, attitudes, and challenges they face when integrating ICT into their teaching practices. By understanding teachers' experiences and viewpoints, this research aims to support educators in maximizing the benefits of ICT in teaching and learning activities by addressing challenges and informing policy formulation by relevant authorities.

Methodology:

The primary aim of this systematic analysis was to provide a concise overview of relevant literature concerning teachers' perceptions and experiences in integrating ICT into their teaching practices. An effective literature review serves to illuminate existing knowledge, identify gaps, and summarize findings (Petticrew and Roberts, 2008). Adhering to the structured nature of literature reviews (Littell et al., 2008), the researcher meticulously followed established methodologies. This involved initiating the review with an introduction, establishing criteria for database selection, timing, and search terms, followed by the systematic selection and categorization of articles to present a comprehensive overview. Finally, the study discusses limitations before delving into the discussion and conclusion sections.

The systematic review methodology employed involves the selection, evaluation, and analysis of previous studies' reports and findings, enabling researchers to draw clear conclusions on unexplored aspects of the subject. While initially utilized primarily in medical studies, Denyer and Tranfield (2009) recognized its applicability in management sciences research. Over time, systematic reviews have become a standard method for locating, selecting, and evaluating research, providing valuable insights for policymakers, researchers, and academia. Denyer and Tranfield (2009) outline five phases of the systematic review process:

Phase 1: Structuring questions/objectives
Phase 2: Locating prior studies
Phase 3: Selecting and evaluating prior studies
Phase 4: Analyzing and synthesizing prior findings
Phase 5: Utilizing and reporting the results.

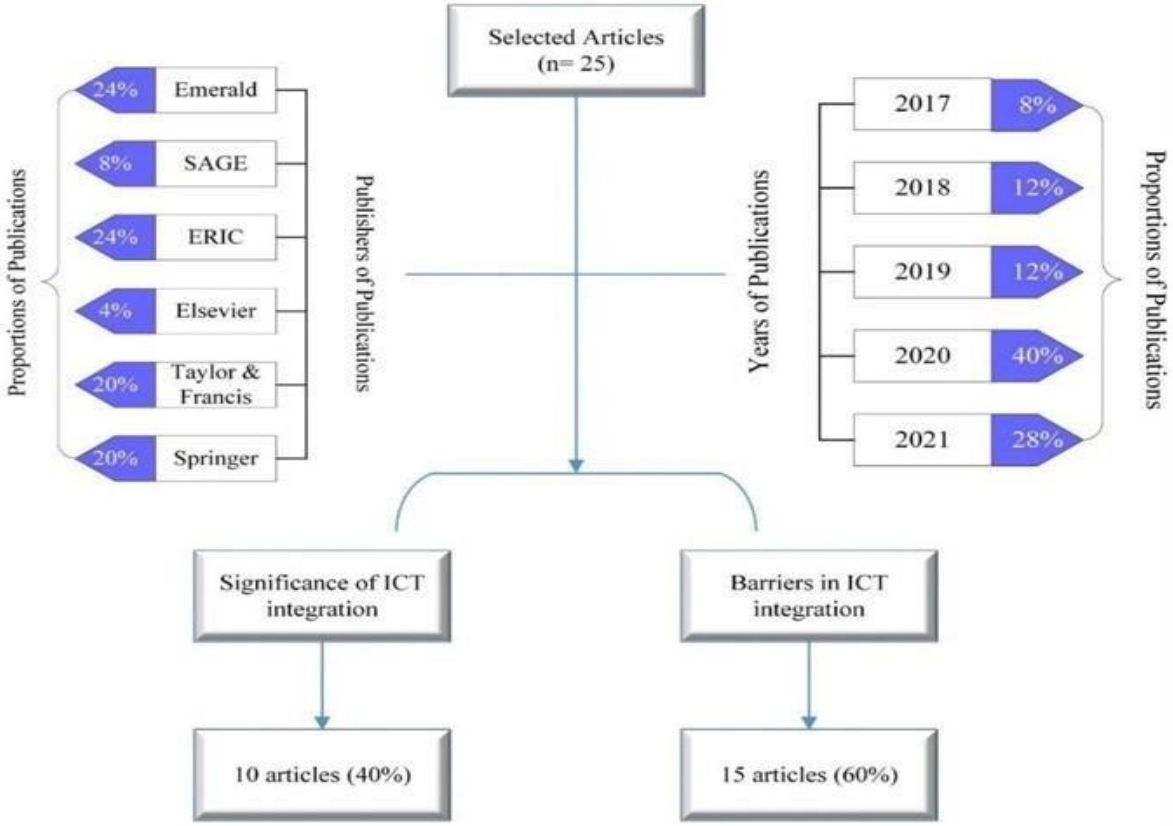
Of the five phases outlined, the initial phase was outlined within the introduction, while subsequent stages were addressed in the methodology and results sections. Additionally, in order to enhance the transparency of the findings, each step of the systematic review was meticulously elucidated (Saunders et al., 2012).

Databases Selection:

The study followed the methodology outlined by Denyer and Tranfield (2009) to examine teachers' experiences, perceived obstacles, and emerging themes related to integrating ICT into teaching and learning practices. Subsequently, a comprehensive search was conducted across major subscribed publishers and platforms, including Emerald, Springer, SAGE, Taylor & Francis, Elsevier, and ERIC (Figure 1), with articles sourced from reputable peer-reviewed academic journals to ensure the credibility of the findings (Saunders et al., 2012).

To provide an updated overview of the literature, articles published within the last five years, spanning from 2017 to 2021, were selected (Figure 1). A total of 25 publications were included, identified through targeted search terms such as teachers' perceptions, beliefs, usage, and attitudes toward ICT integration, as well as encountered challenges in implementation. These key terms were further augmented by incorporating descriptors like school and higher-level to capture a broader spectrum of information. Moreover, terms such as integration, usage, incorporation, and adoption were employed to specifically focus on investigating ICT

integration in teaching practices. Each selected article underwent manual screening of abstracts to ensure alignment with the study's scope. Papers falling outside the scope in terms of publication time, location, or domain were excluded, resulting in a final selection of 25 articles.



Data Analysis

The data extracted from the chosen articles underwent content analysis, a rigorous method employed to scrutinize previous documents such as official reports, books, and publications. This approach is recognized for its efficacy in streamlining sources and qualitatively examining document features (Onwuegbuzie et al., 2012). Teachers' perspectives on integrating technology into teaching and learning practices were thoroughly examined by conscientiously reviewing the literature, with particular attention devoted to identifying factors conducive to successful ICT integration in instructional methods. Subsequently, the findings from the reviewed studies were organized into a table using Microsoft Word and categorized based on their respective information. These factors were then divided into two main groups (Figure 1): the perceived benefits and barriers encountered by teachers during the integration of ICT into their educational practices.

Limitation of Research:

Like all research endeavors, this study encountered limitations stemming from various constraints. Firstly, in striving for genuine insights in the systematic review analysis, only peer-reviewed articles from reputable publishers were considered. Secondly, limitations arose from the key terms employed in the publication search process. For instance, these terms were combined with specific descriptors such as primary, secondary, and higher education teachers to encompass a broader spectrum of research articles.

Results:

The information gathered from the identified articles aligned with the objectives of this study and was subsequently organized chronologically. To investigate the integration of ICT in teaching and learning practices across educational levels, the articles were categorized by educational level, spanning from schools to universities (as depicted in Figure 2). The majority of studies were conducted at the university level, accounting for 64%, followed by those at the school level (28%) and college level (8%).

The choice of methodological approaches in research articles significantly impacts the quality of literature reviews. Accordingly, the sampled studies were categorized based on their methodological approaches, as illustrated in Figure 3. It was observed that the quantitative method was the most commonly employed approach, constituting 52% of the studies, followed by the qualitative method (28%), with the mixed-method approach being the least utilized, comprising 20% of the studies.

Teachers' perceptions regarding technology integration were categorized into two main

paradigms to elucidate the benefits and challenges of ICT in teaching and learning practices. These are delineated below:

Significance of information and communication Technology Integration:

Nevertheless, the effective implementation of technology in teaching and learning practices remains an ongoing challenge in India. Previous research has underscored numerous advantages associated with integrating ICT into our education system, as outlined below (refer to Figure 4).

Connectivity:

According to the majority of research findings, integrating ICT into teaching and learning fosters connectivity among teachers and students, enabling access to educational resources regardless of location or time (Hussain, 2018; Thaheem et al., 2021). Teachers find it convenient to engage with students both within and beyond the classroom using various digital platforms such as WhatsApp, Facebook, and Google groups (Hodgson and Shah, 2017). Moreover, ICT integrationencourages student interaction, facilitating peer-to-peer communication, which aids in resolving academic challenges and promoting social engagement (Asad et al., 2020).

Regarding the benefits observed at the secondary school level, Jogezai et al. (2018) highlighted that teachers incorporating ICT into their instructional methods noted a significant enhancement in student participation during learning activities.

Teachers Self Efficacy:

From a self-efficacy standpoint, the successful integration of ICT in education heavily relies on teachers' belief in their capabilities (Guoyan et al., 2021), as self-efficacy serves as a crucial determinant in achieving desired student learning outcomes. Recognizing the pivotal role of teachers' self-efficacy in effective ICT integration, numerous studies recommend enhancing their pedagogical and technological skills through structured training programs. Khan and Abid's (2021) study highlighted that the transition from traditional face-to-face teaching to online instruction during the COVID-19 period provided opportunities for both teachers and students to develop technological competencies by utilizing various digital tools and platforms. They also advocated for the implementation of an Online Certification Decision Matrix (OCDM) to ensure the efficacy and readiness of teachers for online teaching.

Moreover, Aslam et al. (2021) found that ICT integration enriches the quality of the teaching-learning process, establishing a significant correlation between teachers' Technological Pedagogical and Content Knowledge (TPACK) and their technological competencies. Additionally, Abbasi et al. (2021) identified favorable attitudes among teachers towards incorporating technology into their instructional practices and noted a significant relationship between technology usage and teachers' technological competencies.

Student learning

Teachers play a crucial role in fostering successful online learning experiences for students. The utilization of ICT in teaching-learning practices empowers students to effectively utilize technology in education by accessing, selecting, establishing, and interpreting information. Its seamless integration aids in addressing learners' educational needs by offering innovative solutions to diverse learning inquiries (Rafi et al., 2019). Numerous studies have also demonstrated a significant correlation between technology usage in educational settings and students' academic performance (Asif et al., 2020; Abbasi et al., 2021).

Moreover, to enhance students' creative thinking and academic achievements, Ali et al. (2018) advocate for the efficient utilization of cloud computing, which offers enhanced adaptability in a cost-effective manner. The adoption of cloud services enables educational institutions to meet students' learning requirements without necessitating extensive resources such as multimedia equipment, software, and hardware. Additionally, the integration of ICT in classrooms fosters a stimulating environment for students, encouraging their active engagement in educational activities (Jogezai et al., 2018).

Furthermore, the disruptive phase of COVID-19 presented an opportunity to enhance the effectiveness of teaching-learning practices through ICT integration at the school level. Amid the pandemic, when face-to-face learning opportunities were disrupted due to school closures, the integration of ICT via social media platforms facilitated continuity in learners' educational activities (Jogezai et al., 2021).

Learning materials:

Students' learning experiences are greatly enhanced when they have access to appropriate supplementary materials, such as reference books, workbooks, or educational aids. The effective utilization of such resources not only helps clarify conceptual understanding but also contributes to improved academic performance. In this context, technology-enabled learning facilitates easy access to supportive materials for learners (Hodgson and Shah, 2017).

The research conducted by Habib et al. (2021) highlighted the advantages of utilizing a Learning Management System (LMS) and Management Information System (MIS) to support administrative, teaching, and learning activities at the university level. For example, an LMS enables instructors to share course outlines, reference materials, lesson plans, collect assignments, make important announcements, and provide assessment

feedback. Similarly, students benefit from LMS by gaining convenient access to reference materials, important announcements, and other relevant information regardless of their location or time.

Regarding the benefits of technology integration at the secondary school level, Asif et al. (2020) emphasized that the use of pre-designed resources (such as videos or textual materials) shared byteachers helps students grasp lessons more effectively before teacher-led demonstrations.

Barriers in information and communication Technology Integration:

While the use of technology in education is widespread in developed countries, its adoption remains relatively uncommon in developing nations like India. Numerous studies have explored teachers' perspectives on the barriers to integrating technology into their teaching practices (refer to Figure 5).

However, previous research suggests that many teachers hold positive attitudes towards the incorporation of ICT as a pedagogical tool in their teaching methods. The lack of well-defined educational policies has been identified as a significant obstacle hindering teachers from effectively utilizing technology in their instructional approaches. As a result, the extent of ICT integration from secondary to higher education levels remains uncertain.

Despite the government of India acknowledging the significance of ICT in education and introducing various policies aimed at integrating technology into the educational system, the effective implementation of these policies has not yet been realized. This is primarily due to several barriers, including inadequate teacher training and infrastructure, technological incompetence, limited resource accessibility (Dar et al., 2018), poor communication between teachers and students (Shah et al., 2020), insufficient digital competencies among students (Rafi et al., 2019), lack of adequate learning materials (Abbasi et al., 2021), and absence of cohesive instructional design (Ajmal et al., 2019). Consequently, India continues to lag behind other countries that have successfully integrated technology into their education systems. To address these barriers, educational authorities must develop effective policies for ICT integration in teaching-learning practices and allocate sufficient budgets to achieve these policy objectives.

Some studies have reported low competencies and a tendency among teachers to avoid using technology in their instructional practices. For example, Shah et al. (2020) found that while someteachers reported positive outcomes from incorporating ICT into their teaching, others cited limited time and scheduling constraints as reasons for not using ICT in their practices.

During the COVID-19 crisis, Thaheem et al. (2021) conducted a survey to explore the benefits and challenges encountered by teachers in their online instructional practices. They identified technological challenges, personal constraints, and lack of infrastructure as major obstacles. Similar challenges were reported by Soomro et al. (2020) and Noor et al. (2020), where resistance to ICT integration stemmed from inadequate infrastructure and technological competencies among teachers. This underscores the urgent need for educational authorities to equip all educational institutions with modern and adequate technologies to optimize student learning outcomes.

Furthermore, teachers' attitudes play a pivotal role in determining their utilization of technology in pedagogical practices, reflecting their responses, whether positive or negative, based on their experiences (Abbasi et al., 2021). Numerous studies have explored teachers' attitudes and professional knowledge regarding the application of ICT in pedagogical practices. For example, Ahmed et al. (2017) discovered that while many teachers value social interaction between students and teachers, they perceive online teaching as less interactive compared to face-to-face instruction. Consequently, these teachers exhibit a preference for traditional teaching methods and harbor a negative attitude towards online teaching. Similarly, Afridi and Chaudhry (2019) identified unsatisfactory levels of technology adoption in instructional practices across universities in Punjab due to various constraints. The study recommends providing adequate support to teachers in terms of information technology solutions to enable efficient adoption of the latest technologies.

Online teaching and learning present unique challenges compared to traditional methods, and teachers may struggle to effectively facilitate learners if they lack sufficient competence. In this context, teachers' professional knowledge is deemed essential for the successful integration of technology to enhance instructional practices (Aslam et al., 2020). However, Asad et al. (2020) highlighted positive responses from teachers, despite the lack of support from governing bodies to implement ICT in their pedagogical approaches due to resource constraints and professional competencies. Additionally, Abbasi et al. (2021) and Thaheem et al. (2021) indicated that teachers often face challenges in effectively integrating digital instructional approaches into their curricula. Therefore, it is imperative for educational authorities to provide adequate support to teachers to enhance their technological and professional competencies.

Concerning the implementation of technology in secondary schools, it remains in its early stages (Jogezai et al., 2020). Despite the COVID-19 pandemic prompting the integration of

technology into teaching and learning at the school level, full integration has not yet been realized. For instance, Ullah and Ali (2021) observed that during the COVID-19 period, students attending elite private schools in urban areas had an advantage in online learning compared to students from rural public schools due to inadequate infrastructure and a shortage of competent teachers.

Discussion:

In today's classroom environment, effective teachers are expected to bring innovation to their instructional methods. Technology plays a crucial role in fostering innovation in teaching practices, and its successful integration supports students in meeting their learning objectives. As teachers' instructional approaches are heavily influenced by their pedagogical beliefs, they tend to favor technological applications that align with their teaching strategies and beliefs about learning. Therefore, this study aims to provide comprehensive insights into teachers' perceptions regarding the advantages, willingness, attitudes, and challenges they face when integrating ICT into their teaching practices.

The analysis revealed a significant increase in the number of articles addressing technology-integrated teaching and learning practices over the past five years. Most of these studies were conducted at the university level, followed by the school and college levels, respectively. This aligns with the observation made by Turan and Akdag-Cimen (2020), who noted a widespread focus on technology-integrated educational research among university-level participants due to easy accessibility and the tendency to follow trends. However, it is believed that integrating technology into teaching and learning practices can benefit learners at all levels. Therefore, further research should be conducted at the college and school levels to gain valuable insights into technology-integrated teaching and learning practices at these levels.

Despite the potential benefits, India has yet to achieve the desired implementation of technology- incorporated teaching and learning practices. The reviewed articles have highlighted several positive aspects of integrating ICT into educational practices, with consistent reports of students' academic growth attributed to a motivating learning environment that keeps them engaged in active learning activities. Additionally, technology-assisted learning facilitates easy access to supportive materials, clarifying concepts and enhancing academic achievement. This finding is consistent with the observations of Liu et al. (2022), where learners reported high levels of cognitive understanding and learning achievements in MOOC discussion forums. Therefore, to further enhance students' learning outcomes, it is recommended for teachers to design inquiry- based and open discussion activities integrated with learning materials.

One of the identified advantages from the reviewed literature is that integrating ICT into teaching and learning practices fosters connectivity between teachers and students, aiding students in addressing academic challenges. Liu Z. et al. (2021) suggested leveraging social media platforms to actively engage learners in online learning activities. Therefore, educators should assign various communicative and group discussion tasks to optimize students' interaction with instructors and peers, thereby enhancing comprehension and problem-solving abilities.

Additionally, teachers' proficiency in both professional and technological aspects is essential for effective ICT integration in instructional practices, which is closely linked to their self-efficacy. The reviewed articles confirm that utilizing ICT in teaching and learning enhances teachers' competencies across various domains. Watson and Rockinson-Szapkiw (2021) emphasized that technology-integrated instructional practices not only improve teaching quality but also enhance teachers' pedagogical and technological skills. However, despite these benefits, technological inadequacy among teachers emerged as a common challenge in the reviewed studies. Hassan (2021) also highlighted the difficulties faced by faculty members in adopting ICT due to insufficient technological competencies. Therefore, it is imperative for authorities to support teachers by organizing training programs to bolster their technological skills. Additionally, governments should prioritize the successful integration of ICT in educational institutions and offer incentives or certifications to motivate teachers.

Furthermore, adequate resources and up-to-date infrastructure are crucial for the seamless integration of technology into educational practices. However, inadequate infrastructure and limited resources were identified as significant challenges hindering effective technology integration in instructional practices. García-Morales et al. (2021) echoed similar sentiments, advocating for adequate infrastructure and technological resources to sustain effective teaching and learning practices. Hence, authorities should allocate sufficient budgets to equip teachers and students with the necessary resources and updated infrastructure to maximize the benefits of ICT in education.

Furthermore, active engagement of students with clear communication channels with their teachers and peers is indispensable for effective learning. However, the reviewed articles suggestthat teachers perceive online teaching as less interactive compared to face-to-face instruction due to the lack of direct communication with students and their limited participation. Hence, it is imperative for

educators to design collaborative activities, such as computer-supported collaborative concept mapping (CSCCM), to enhance students' comprehension and foster collaboration with both instructors and peers (Liu S. et al., 2021).

Recognizing the current needs and aligning educational goals and objectives accordingly is the primary responsibility of governing bodies to achieve desired outcomes. However, the absence of well-defined educational policies, as highlighted in the reviewed articles, poses a significant hurdle in effectively incorporating technology into educational practices and proves challenging to overcome. Therefore, to address these barriers, educational authorities must develop effective policies to integrate ICT into teaching and learning practices that cater to the country's current educational needs and academic settings at all levels.

Sufficient time allocation plays a crucial role in enabling teachers to fulfill their teaching responsibilities effectively, especially in integrating ICT into their instructional practices. However, the reviewed literature indicates that teachers often struggle to find adequate time to complete various pedagogical tasks necessary for ICT integration, such as lesson planning, note- taking, and delivering lectures. Similarly, Akram et al. (2021b) identified time constraints reported by teachers, hindering the efficient use of ICT to enhance instructional effectiveness. Therefore, it is essential to support teachers by providing professional development opportunities and time management programs, both for pre-service and in-service teachers, to address these potential constraints.

Conclusion:

The systematic review confirms that teachers widely accept the use of ICT in teaching and learning practices, aiding learners in achieving educational objectives across various domains, making it indispensable at all educational levels. However, the utilization of technology in secondary school education is still in its early stages compared to higher levels. Nevertheless, theshifts prompted by the COVID-19 pandemic have presented an opportunity to enhance the efficacy of teaching and learning practices through ICT integration across all educational tiers. Additionally, the findings highlight numerous barriers impeding the effective integration of technology in teaching and learning, including resource constraints, lack of leadership support, limited access to ICT infrastructure, time constraints, ambiguous policies, inadequate professional development, insufficient technical assistance, and absence of suitable pedagogical frameworks. Addressing these challenges is crucial for educational authorities to bridge the gaps hindering effective technology integration and to maximize the benefits of technology-enhanced teaching and learning.

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