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A Pragmatic Review On The Integration Of ICT In The Teaching-Learning Process

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The use of technology is standard in every sector of the 21st century. It makes the work easier and increases productivity. Likewise, technology is also adopted in the teaching-learning process, playing a crucial role in making the learning process more interactive and enjoyable. A total number of twenty-six articles were analyzed (i) to reveal the teachers' perception towards the ICT integration in the teaching-learning process, (ii) to reveal the students' attitude towards the ICT use in the teaching-learning process, and (iii) to find out the benefits and barriers of ICT integration in the teaching-learning process. The published articles are selected from the Google Scholar database. The study's significant findings revealed that most teachers and students effectively integrated and utilised ICT, demonstrating a positive attitude toward its integration. Furthermore, it showed that ICT integration enhances teachers' teaching skills and competencies, providing better learning experiences for students.

Keywords: ICT, Perception, Teaching-Learning Process.

Introduction

With the rapid growth and development of science and technology, information and communication technology (ICT) emerged as a suitable tool for enhancing knowledge along with economic and social development (Vooget and Pareja, 2012). Nowadays, technology has been integrated into all areas of our society and is a major aspect of the education sector. ICT competencies, which include literacy in these technologies (K¨onig et al., 2022), are therefore necessary for students to grasp these technologies (Almerich et al., 2021; 2024; Olszewski & Crompton, 2020).

Since ICT integration cannot be achieved if teachers are not equipped to use technology, teachers have emerged as a crucial component of this process (Almerich et al., 2023; Ertmer, 2005; Kirschner and DeBruyckere, 2017; Su´arez-Rodríguez et al., 2018). Teachers are the stakeholders who carry the obligation of incorporating technologies into daily educational practice (Almerich et al., 2023). One important consideration when incorporating ICT into the classroom is the pedagogical views of the teachers (Cheng et al., 2022; Deng et

al., 2014; Ertmer et al., 2012, 2015; Inan & Lowther, 2010; Kim et al., 2013; Tondeur et al., 2017).

Since ICT provides a variety of tools that are utilised in both traditional and online learning environments and helps create a proactive classroom environment (Jogezai et al., 2021), it has revolutionised the education sector and made instructional practices more interactive and productive (Lin et al., 2017). In addition to improving teaching quality (Akram et al., 2021a; 2022), technology-integrated instructional techniques help students grow as individuals, increase their motivation, and effectively learn new material (Chen et al., 2018).

As an alternative to physical mode classroom transaction, ICT-integrated teaching and learning offered a more adaptable method and improved access to learning possibilities (Akram et al., 2021b). Although the temporary phase enhanced their digital skills, teachers' insufficient technological competencies hindered their ability to fully utilise ICT in their teaching practices (Chaiban & Oweini, 2024). According to Watson and Rockinson-Szapkiw (2021), innovative educational practices indicate that understanding technology integration requires taking into account instructors' viewpoints on technology use.

Several studies also showed a significant relationship between technology usage in educational practices and students' academic achievement (Asif et al., 2020; Abbasi et al., 2021). Furthermore, to enhance students' creative thinking and academic performance, Ali et al. (2018) advocated that cloud computing facilitates students' learning efficiently with better adaptability in a cost-effective way.

According to Hodgson and Shah (2017), technology-assisted learning makes it simple for students to obtain helpful educational resources. The advantages of a learning management system (LMS) and management information system (MIS) in assisting with administrative, instructional, and learning activities at the university level were illustrated in the study conducted by Habib et al. (2021). Teachers can share course outlines, reference materials, lesson plans, assignment submissions, critical announcements, and assessment results, for example, using an LMS.

Therefore, in the present study, an attempt has been made to review the articles (published between 2012-24) regarding the perception of teachers and students towards the use of ICT integration into the teaching-learning process. The study aims to analyse the perception and attitude of teachers and students towards the integration of ICT into the teaching-learning process. So many challenges are there in integrating ICT into the teaching-learning process. How the teachers are overcoming these challenges and using ICT in the classroom is another aim of this study. How are students and teachers benefiting from the use of ICT? This is to be analysed in the present study.

Review Framework

Today, various ICT tools and approaches are available on various platforms. The ICT integration is the combination of various tools. The effective use of ICT tools requires careful planning and strategic execution. As teachers and students are exposed to a variety of ICT tools, they should be aware of the utility of these tools to their specific requirements. Teachers generally use ICT tools for two purposes: one for the teaching process and the second for Assessment purposes.

The selection of ICT tools for the integration is essential for both teachers and students. The ICT integration also requires proper infrastructure and support for teachers. The availability and accessibility of resources are more important, which requires effective systems. Therefore, administrators, stakeholders, schools, and higher education departments should provide basic support to teachers and students. Effective use and integration require in-depth research study as many practitioners are searching for the best ICT tools for their practices. Therefore, in the present study, the researcher aimed to investigate teachers' perceptions of ICT integration in the teaching-learning process across various educational institutions. The present study focused on two key research questions.

- What are the teacher's perceptions towards the ICT integration in the teaching-learning process?
- What are the students' attitudes towards using ICT in the teaching and learning process?
- What are the benefits and barriers to integrating ICT?

Methods

In the present review study, 37 articles published over the last 12 years were reviewed to reveal teachers' perceptions of ICT integration in the teaching-learning process. Among the articles, three were related to higher education, teacher education, and school education. The articles reviewed in this study were published in UGC-CARE, SCOPUS-indexed, and Web of Science journals. For the study, articles were collected from various web databases, including Google Scholar, Taylor & Francis, Elsevier, Springer, and Scopus String searchers, including a few keywords such as 'ICT,' 'Integration,' 'ICT integrations towards the teaching-learning process,' perception of teachers using ICT,' 'perception of students towards ICT use,' ICT and higher education,' 'ICT and teacher education,' 'ICT and school education,' 'ICT and India,' and 'ICT and Odisha', etc.

Then, the abstract and full-length papers were read, and, as per the requirements of the present study, only 24 articles were selected for review. All relevant articles were thoroughly examined for information extraction and entered into the databases, including details such as publication information, year, location, subject area, methodology, population, sample size, sampling techniques, tools used, and conclusions. The norms for this study adopted to examine the quality of the articles cited in Swain and Pathak (2024) were adopted.

The study's design

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Page et al., 2021) were used for this systematic review. The researchers widely used the review guidelines for the review work. Searching for research articles, screening them, and then incorporating them into the present study's analysis, following the workflow established by the foundation.

Finding, inclusion, and exclusion of articles

A few articles were searched from various search engines, and during this phase, some were omitted. The articles were identified using the keywords mentioned above. Three hundred seventy-eight articles were identified and saved in this phase. Then, reading the abstracts of the articles, the full-length papers were downloaded and saved to the files. A few of the papers were not open-access, so those were excluded at this stage. Articles not related to this study and full-length papers not available were excluded from the list. Furthermore, the articles were not indexed in the Scopus database; unpublished PhD theses, conference proceedings, and articles published in non-referred journals are also excluded. The research articles and review papers fulfill the study's objective and were included in the present study.

Extraction of Data

A distinct code was given to each study paper to collect the responses to the stated research questions. Initially, comprehensive information was collected by reading each paper, encompassing the journal title, year of publication, and list of authors. Articles were classified and selected based on the study methodology, including descriptive studies, mixed-methods studies, qualitative studies, or quantitative studies. Table 1 shows a detailed description of the selected articles.

Selected Paper

The next phase was then to select the papers for the study. In this phase, the abstracts of the articles were carefully examined. After reading the abstract, the articles that satisfied the requirement were selected and saved for further examination. A total of 72 full-length papers were selected for additional examination. Articles that did not reveal the integration of ICT in the teaching-learning process, the teachers' perception of ICT integration, the students' use of ICT, or the benefits and barriers associated with using ICT were excluded. Based on these criteria, 24 papers were finally selected and included in the subsequent analysis phase. All 24 articles were listed in tabular form to provide a comprehensive overview of the reviewed papers. In the present study, articles with a sample size of less than 30 are considered small-size articles, while articles with a sample size of 30 or more are considered large-sample articles.

Table -1 Description of the articles included in the present study

Sl. No.	Author (s) Name and year	Nature of article	Region / Country	Subject	Purpose	Sample	Tools	Method	Sample size	Major findings
A	**Higher Education**									
1	Mollaei and Riasati, 2013	Research Article	Australia	English	Perception of Teachers	4O Undergraduate and Graduate Teachers	Questionnaire	Descriptive method	Small	Most teachers said that their willingness and desire to use ICT in class help students improve their language skills. Computer-

										assisted classrooms create a self-directed and independent learning climate, which increases students' learning.
2	Buabeng, 2012	Research Article	Ghana	Educational Technology	Perception and Practices of ICT	273 Teachers	Questionnaire	Descriptive Study	Large	The study indicated a favorable correlation between ICT utilization and teachers' competencies. The teachers also demonstrated a positive attitude toward the use of ICT. The study suggested including computer-supported learning and ICT integration courses in initial teacher training programs, which will help teachers become more confident in using ICT.
3	Zamir., 2019	Research Article	Pakistan	Education	Perceptions, Attitude, and Motivation	377 university teachers from 51 higher education institutions	Questionnaire	Descriptive Study	Large	The findings highlighted that the teachers competent in ICT show tremendous enthusiasm for integrating ICT into higher education. The Effective use of technology depends on multiple teacher-related factors, such as their knowledge, competency, experience, and willingness to adapt. University teachers with a positive attitude towards ICT use still require the successful integration of

										administrative support, infrastructure facilities, and student cooperation, and also highlight the need for immediate planning of ICT training programs for university teachers.
B	**Teacher Education**									
4	Zhang et al., 2022	Research Article	USA, China	Education	ICT integration	204 preservice teachers	structural model	Descriptive	Large	Preservice teachers perceived that ICT integration self-efficacy did not affect their competencies in ICT.
5	Erdemir, and Ekşi., 2019.	Research Article	Turkey	Educational Studies	Perceptions of Student Teachers	31 student teachers	questionnaire	Descriptive	Small	The findings revealed that teaching using Edmodo and flipped classrooms is effective in enhancing the digital skills of student teachers. As student teachers will become future teachers, this experience will provide them with a rich foundation that can be applied during their teaching careers.
6	Sreekala and Arokia, 2017	Research Article	India	Education	Student Teachers Perception	29 student teachers	Perception Scale	Experimental Study	Small	Student teacher's positive perception is the first step toward the effective use of technology in the teaching and learning process. Therefore, student teachers also need to be trained, and a strong support system must be

										in place to help teachers effectively adopt technologies in the classroom.
	School Education									
7	Rahmi et al. 2019	Research Article	Indonesia	Social Sciences	Practical Analysis	73 Elementary School Teachers from 17 Schools	Questionnaire	descriptive study	Large	The study's primary objective was to explore teachers' perceptions of using ICT in the classroom. The teachers considered that ICT use makes their classes more effective and enjoyable.
8	Chaiban and Oweini, 2024	Research Article	Lebanon	Education and Social Sciences	Practical Analysis	4 Schools	Survey	Quantitative descriptive method	Small	This study reveals that teachers generally hold a positive attitude toward integrating ICT. At the same time, it was recommended that this integration be sustainable in the school.
9	Shrestha, 2022	Research Article	Nepal	English	ICT Practices	10 Teachers from the secondary level	Questionnaire	Descriptive method	Small	The majority of teachers viewed the use of ICT in the teaching-learning process as beneficial for students, as it helps motivate them and facilitates their learning.
10	Qasem and Viswanatha, 2016	Research Article	India	Education	Trend	60 Science Teachers from Secondary Schools	Questionnaire	Experimental Intervention	Large	The study emphasized the use of a blended learning approach by teachers, as it provides variations in teaching and learning approaches, which create an enjoyable and effective academic environment.

11	Ghavifekr, et al., 2016	Research Article	Malaysia	Educational Technology	Issues and Challenges from Teachers' Perception	100 secondary school teachers	survey questionnaire.	quantitative methodology	Large	The study suggests that eliminating these barriers requires a comprehensive strategy, including improved ICT infrastructure, enhanced technical support for teachers and students, specialized professional development programs, and enabling teachers' access to ICT resources.
12	Ratminingsih et al. 2018	Research Article	Indonesia	English	Perception and Motivation of Students	30 Primary School English Teacher	Observation Schedule	Descriptive Study	Small	Teachers had excellent perceptions of ICT-based interactive games in teaching the English language. Students also showed high motivation in learning the English language through ICT-based interactive games, which helps achieve better learning outcomes for the students.
13	Corporan at al., 2020	Research Article	Spain	Educational Sciences	Perception	542 Secondary Education Teachers	Questionnaire	Descriptive Study	Large	The study's findings indicate that teachers require additional training in adopting collaborative learning techniques and utilizing ICT-mediated technology to facilitate an effective teaching and learning process.
14	Asnandi, 2018	Research Article	Indonesia	English	Teacher and Students'	06 English Teachers	Questionnaire	Descriptive Study	Large	There existed a positive perception of

					Perception of ICT-Based Interactive Game	and 152 Students				teachers regarding the practices of ICT-based Interactive Games in English teachers for VI-grade students. Additionally, students exhibited a positive perception of ICT-based Interactive Games concerning their learning motivation and English proficiency.
15	Abel et al., 2022	Review Article	Switzerland	Education	Perception	22 Qualitative Research		Meta-ethnography method	Small	Local context and global educational trends affect the teacher's perception of using ICT in the classroom. The infrastructure facility and the professional training were also essential in motivating teachers to adopt ICT in the classroom.
16	Gebremedhin and Fenta, 2015	Research Article	Ethiopia	Education and Practice	Teachers' Perception	72 Teachers	Questionnaire	Descriptive Study	Large	The majority of teachers did not utilize ICT due to a shortage of ICT infrastructure and a lack of support from the system. The perception of ICT integration among teachers is generally positive, but they require additional support and training in this area. The teacher recognized that productivity would increase if ICT were effectively

										integrated into the teaching and learning process. Teachers also revealed that a lack of technical knowledge among teachers and a shortage of resources were the barriers to ICT integration.
17	Coban and Atasoy., 2019	Research Article	Turkey	Educational Sciences	Teachers' self-efficacy perception of ICT	42,307 teachers	Teachers' Self-efficacy Perception on ICT Scale and Teachers' Attitude towards ICT Usage Scale	Descriptive method	Large	The study reveals that teachers with higher self-efficacy were more willing to adopt and integrate ICT into their teaching. It also stated that confident teachers had a positive attitude and were motivated to use technology.
18	Akram et al., 2022	Systematic Review	China, Saudi Arabia and Pakistan	Psychology	Teacher' Perception	25 Articles	Denyer and Tranfield (2009), Model	Mixed methods systematic review	Small	The findings suggest that teachers believe technology enhances instructional practices by making learning more engaging, interactive, and practical, which motivates students to learn and have positive learning experiences. Additionally, challenges such as slow internet speeds, frequent power outages, and inadequate infrastructure demotivate teachers from incorporating ICT into t20 teaching and learning proces21

19	Pardede, 2020	Research Article	Jakarta	English	Students' Perception	197 students in 15 secondary schools	questionnaire	Descriptive method	Large	The survey result reveals that students have a high positive attitude towards ICT. The use of ICT increases students' interest and motivation. However, students were distracted as they frequently use technology for entertainment and socio-economic purposes.
20	Negrín-Medina, et al. 2022	Research Article	Spain	Open	Teachers' Perceptions	60 teachers	Interview Schedule	mixed (qualitative and quantitative) and multiphase methodology	Large	ICT facilitates the professional growth of teachers. Simultaneously, it creates difficulties, as students are also exposed to various technologies that have evolved, which in turn attracts them to entertainment and social contexts.
21	Mirzajani, et al., 2016	Research Article	Iran	Education	Teachers' acceptance of ICT Integration	65	semi-structured interviews	Descriptive method	Large	ICT integration requires adequate support from administrators and teachers to effectively integrate ICT into the teaching and learning process. The utilization of ICT requires knowledge, teacher competency, and adequate resources. The barriers, such as insufficient technological support, also demotivated teachers to use ICT.

22	Almerich, et al., 2024	Research Article	Spain	Teacher Education	ICT Integration	1002 Primary and Secondary Education teachers.	questionnaire	quantitative correlational study	Large	The study revealed that teachers believed using ICT had a positive impact on students' learning. The use of ICT always requires well-planned technological resources.
23	Arredondo-Trapero, et al., 2021	Research Article	Mexico	Engineering and Sciences	teachers' perceptions	20 teachers	questionnaire	Descriptive	Small	The use of ICT encountered many problems, such as cyberbullying, cyber violence, online pornography, and excessive use of video games on the part of students; teachers need more strategies to overcome all these uses of ICT properly.
24	Mura and Diamantini, 2014	Research Article	Italy	Social and Behavioral Sciences	Use and Perception of ICT	796 educators	online questionnaire	Descriptive	Large	The study results indicated that educators require additional training and ICT support to effectively utilize ICT. Furthermore, it was also found that problems such as internet addiction or cyberbullying at all school levels need careful strategies.

Results and Discussion

Description of the articles

In this review study, three articles from Higher Education were based on teacher perceptions, three articles from Teacher Education, among which two focused on the perceptions of student teachers and one on ICT integration, and 18 articles from School Education were based on the perception of teachers, ICT practices, ICT integration, and Issues and challenges were

selected. Therefore, 24 articles were reviewed in this study, and two of these articles were review-based.

The articles finalized for this study were published between 2024 and 2012. Out of these, 37.5% of the articles' sample sizes are less than 50, which is considered a small sample size, and 62.5% of the articles' sample sizes are more than 50; out of these, only two articles had a large sample size (>1000). Furthermore, out of these articles, 8.33% analyzed the data quantitatively, and 16.66% analyzed the data and validated it using different statistical techniques. The details of the tools used for the data collection are shown in Table 1.

Perception of the use of ICT

Findings Regarding the ICT Integration Research Between 2012-2024

Zhang et al. (2022) reported a moderate, positive direct effect of self-efficacy on ICT integration and the use of self-regulated learning strategies. Teachers are increasingly using technological resources to facilitate constructive conception, as reported by Almerich et al. (2024). The findings of Mirzajani et al. (2016) revealed that ICT integration in the classroom requires teachers to possess appropriate ICT skills and knowledge, as well as adequate resources. Furthermore, the pre-service teachers stated that ICT integration self-efficacy did not directly impact their competencies, as reported by Zhang et al. (2022). Buabeng, (2012). The study suggested including computer-supported learning and ICT integration courses in initial teacher training programs, which will help teachers become more confident in using ICT. ICT integration requires adequate support from administrators and teachers to effectively integrate ICT into the teaching and learning process. (Mirzajani, et al., 2016)

Findings Regarding Perception of Teachers on the Use of ICT Research Between 2012-2024

Most studies have shown that teachers generally have a positive attitude toward integrating information and communication technology (ICT) into the teaching and learning process. Chaiban and Oweini (2024) reported that teachers generally hold a positive attitude toward integrating ICT. Most teachers said that their willingness and desire to use ICT in class help students improve their language skills. Mollaei and Riasati, (2013). Buabeng (2012) found a favorable correlation between ICT utilization and teachers' competencies, and the teachers also demonstrated a positive attitude toward the use of ICT. Shrestha (2022) reported that the majority of teachers were equipped with electronic gadgets, such as laptops and desktop computers, and had access to reliable internet both in school and at home. The utilization of ICT requires knowledge, teacher competency, and adequate resources. (Mirzajani, et al., 2016). Zamir., (2019) highlighted that teachers competent in technologies and ICT show tremendous enthusiasm for integrating ICT into higher education. The Effective use of technology depends on multiple teacher-related factors, such as their knowledge, competency, experience, and willingness to adapt. Ratminingsih et al. (2018) reported that teachers had excellent perceptions of ICT-based interactive games in teaching the English language. Qasem and Viswanatha (2016) found that teachers emphasized the use of a blended learning approach, as it provides variations in teaching and learning approaches, which create an enjoyable and

effective academic environment. There existed a positive perception of teachers regarding the practices of ICT-based Interactive Games in English teachers for VI-grade students. (Asnandi, 2018). Local context and global educational trends affect the teacher's perception of using ICT in the classroom. The infrastructure facility and the professional training were also essential in motivating teachers to adopt ICT in the classroom. (Abel et al., 2022). Gebremedhin and Fenta (2015) found that teachers' perception of ICT integration is generally positive, but they require additional support and training in this area. The teacher recognized that productivity would increase if ICT were effectively integrated into the teaching and learning process. Teachers with higher self-efficacy were more willing to adopt and integrate ICT into their teaching. It also stated that confident teachers had a positive attitude and were motivated to use technology. (Coban and Atasoy., 2019). Akram et al. (2022) revealed that teachers believe technology enhances instructional practices by making learning more engaging, interactive, and practical, which motivates students to learn and have positive learning experiences. Almerich et al. (2024) found that teachers believed using ICT had a positive impact on students' learning and that the use of ICT always requires well-planned technological resources. Mura and Diamantini (2014) indicated that educators require additional training and ICT support to utilize ICT effectively.

Findings Regarding Students' Attitudes Towards Using ICT Research Between 2012-2024

All the research articles in this study related to students' perceptions of ICT use in the teaching and learning process showed positive attitudes. Pardede (2020) revealed that students had a highly positive attitude toward ICT, and the use of ICT increases students' interest and motivation.

Students exhibited a positive perception of ICT-based interactive games in terms of their learning motivation and English proficiency. (Asnandi, 2018). Students also showed high motivation in learning the English language through ICT-based interactive games, which helps achieve better learning outcomes for the students. (Ratminingsih et al. 2018).

Findings Regarding the Benefits of ICT Integration Research Between 2012-2024

Regarding the benefits of using ICT in teaching and learning, all teachers and students highlighted the advantages of this approach. Buabeng (2012) found that incorporating computer-supported learning and ICT integration courses into initial teacher training programs helps teachers become more confident in using ICT. The majority of teachers viewed the use of ICT in the teaching-learning process as beneficial for students, as it helps motivate them and facilitates their learning. (Shrestha,2022). According to Rahmi et al. (2019), the teachers considered that ICT use makes their classes more effective and enjoyable. Computer-assisted classrooms create a self-directed and independent learning climate, which increases students' learning. (Mollaei and Riasati,2013). ICT use not only improves students' learning but also facilitates the professional growth of teachers (Negrín-Medina et al., 2022).

Findings Regarding the Barriers to ICT Integration Research Between 2012-2024

Although all the findings of the study related to the perception of teachers and students showed positive attitudes towards ICT integration, several barriers also emerged from these study papers. The most significant challenge of ICT integration was the students' inability to utilize digital technology effectively. (Arredondo-Trapero et al. 2021). Gebremedhin and Fenta (2015) revealed that a lack of technical knowledge among teachers was also a barrier to the integration of ICT. Challenges such as slow internet speeds, frequent power outages, and inadequate infrastructure demotivate teachers from incorporating ICT into the teaching and learning process. (Akram et al.,2022). It creates difficulties for students, as students are also exposed to various technologies that have evolved, which in turn attracts them to entertainment and social contexts. (Negrín-Medina, et al.2022 and Pardede, 2020)). Therefore, students were confronted with problems like cyberbullying (Mura & Diamantini, 2014), cyber violence, online pornography, and excessive use of video games, which easily distracted them from learning. (Arredondo-Trapero et al. 2021).

Additionally, barriers such as insufficient technological support also demotivated teachers from using IC. (Mirzajani, et al.,2016). Gebremedhin and Fenta (2015) reported that the majority of teachers did not utilize ICT due to a shortage of ICT infrastructure and a lack of support from the system. In this regard, a comprehensive strategy includes improved ICT infrastructure, enhanced technical support for teachers and students, specialized professional development programs, and enabling teachers' access to ICT resources. (Ghavifekr, et al.,2016).

Conclusion

The present study revealed that ICT integration consistently had a more significant positive impact on students' learning (Shrestha,2022) and was also beneficial for teachers' professional development. (Negrín-Medina et al., 2022). The study also highlighted many challenges and benefits of integrating ICT. So. It can be concluded that ICT integration must be incorporated into the learning process, which always requires well-planned strategies and adequate technological resources. (Almerich, et al.,2024). This study also observed that teachers require additional training and ICT support to utilize ICT effectively (Mura & Diamantini,2014). For this purpose, adequate support from administrators and directives to be given to teachers to use ICT (Mirzajani et al.,2016) because successful integration requires administrative support, infrastructure facilities, and student cooperation, and also highlights the need for immediate planning of ICT training programs for university teachers, (Zamir.,2019), which can make integration sustainable in the teaching-learning process (Chaiban & Oweini,2024). Furthermore, the study found that teachers also require professional training in integrating ICT to be essential in motivating them to adopt ICT in the classroom (Abel et al., 2022; Gebremedhin & Fenta, 2015). The findings of Corporan et al. (2020) also indicate that teachers require additional training in adopting collaborative learning techniques and utilizing ICT-mediated technology to facilitate an effective teaching and learning process.

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