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Elementary School Teachers' Perspectives on Integrating Technology, Information, and Communication in Education

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ABSTRACT

The integration of information and communication technology (ICT) in education offers significant opportunities for enhancing teaching and learning in the 21st century. This study aims to analyze elementary school teachers' perceptions of ICT utilization in public schools in Kebumen Regency. A quantitative, cross-sectional survey design was employed. Data were collected from 109 elementary school teachers through online questionnaires distributed via Google Forms. Responses were measured using a 4-point Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Descriptive statistical analysis was used to interpret the data. Findings indicate that teachers hold highly positive perceptions of ICT integration in learning. The perceived impact of ICT on student interest and motivation received an average score of 3.79, while the perceived benefits of ICT in learning scored 3.72. Teachers also acknowledged the educational value of ICT (mean score: 3.57) and expressed confidence in their ICT competence (mean score: 3.29). All scores fall within the high to very high category, suggesting strong support for ICT usage in the classroom. These results highlight a favorable outlook among primary school teachers regarding ICT in education. However, limitations exist, as the study focuses solely on elementary-level educators. The generalizability of findings to higher educational levels may be limited. Teachers in Kebumen exhibit strong support for ICT integration in primary education. Future research should consider longitudinal studies or expand to higher education contexts to assess the broader impact of ICT on teaching and learning outcomes.

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1. INTRODUCTION

Information and communication technology (ICT) is a catalyst for the dynamics of the era's development to help science's growth and development. Technological advances broadly influence every line of life, such as education. Technology is an urgent need in the world of education. ICT has the potential to develop learning and enable acceleration, expansion, effectiveness, and productivity (Pardede, 2015). ICT becomes a medium for students to search for references and explore the

knowledge and information needed. The integration of ICT in education has an impact on improving the quality of education as a means of developing human resources as a whole, as well as maximizing the abilities of students (Anshori, 2017; Jamieson-Proctor et al., 2013).

The use of ICT in learning has reached a wide area so that teachers can access information effectively and efficiently. ICT also provides services that help teachers expand beyond classroom spaces (Haygood, Garner, & Johnson, 2012). The development of ICT in education makes the internet and teachers not only information tools but also sources of knowledge, collaboration media, and learning resources (Suleiman, Yahya, & Tukur, 2020). The existence of ICT is increasingly integrated in its role as a learning resource. Learning is increasingly interactive, massive, and integrated with the lives of students. The development of ICT helps to form barrier-free information and communication traffic.

Indonesia is a country that uses ICT in learning. The use of ICT continues to be encouraged and required along with the implementation of the independent curriculum. The use of ICT is no longer taught as a separate subject but is collaborated with other subject content as a source and learning media (Roemintoyo & Budiarto, 2021). ICT integration focuses on the utilization of IT-based learning media, such as Edmodo, Google Meet, Quizziz, PowerPoint, video, and other media that are often used by teachers. At each level of education, teachers generally use media that children have encountered. They often collaborate physical and non-physical media (ICT) in several subjects at once. Many assume that the use of ICT affects children's enthusiasm for learning. The impact of ICT integration in Indonesia still varies from one school to another.

The variety of studies is associated with the obstacles experienced by teachers in integrating ICT. These obstacles are divided into external and internal factors (Kopcha, 2010; Wachira & Keengwe, 2011). External factors include the availability of hardware, software, and policy support or principal leadership. The facts in the field show quite concerning conditions. For example, limited portals to ICT facilities and infrastructure, suboptimal ICT application design, lack of policy support by the government, limited funding, and technical constraints often become obstacles for teachers to integrate ICT into learning (Rana & Rana, 2020; Solangi, Longsheng, Ahsan, & Shah, 2021). Meanwhile, internal factors include teachers' attitudes, beliefs, knowledge, perceptions and ICT skills (Ifinedo, Rikala, & Timo, 2020). This is the basis that teachers need to have before they use ICT in learning. Teachers who are not competent in operating ICT will only waste time in learning.

As a party directly pertinent to learning, teachers have a vital role in making the combination of ICT in learning successful. The utilization of ICT in learning is a form of effort to center learning on students (Qaddumi, Bartram, & Qashmar, 2021). Teachers become actors who play the tool. ICT-based learning can be successful if teachers are positive, confident, and competent in the practice.

Research on ICT integration in learning in Indonesia is quite large. Likewise, the number of studies investigating teachers' perceptions of ICT integration in learning is increasing. However, most previous studies have focused on the context of higher education (Kristianto, 2017; Pramana, 2018), junior high school education context (Parlindungan Pardede & Sunarto, 2020), rural context (Mahdum, Handriana, & Safriyanti, 2019), and focus on a particular discipline (Cakrawati, 2017; P Pardede, 2019).

Research investigating the integration of ICT in learning from the perspective of elementary school teachers is still rare. In fact, this has great potential as a form of offering to improve the quality of learning. The limited research on the perceptions of elementary school teachers closes the possibility of issuing practical policies for elementary school teachers. Every teacher at every level should have the same rights to information that optimizes the quality of education in their school. In addition, the limited research of this kind can trigger a gap between teachers and a decline in student learning achievement. Therefore, this study was conducted to fill this gap. The gap is in the form of information on the perceptions of elementary school teachers towards ICT in learning. This information is very urgent as evaluation material for policy makers in determining regulations that are in accordance with the current conditions of elementary school teachers.

Through these basic considerations and background, the goal of this study is to scour teachers' perceptions of the utilization of ICT in learning in elementary schools in Kebumen. As an effort to achieve this goal, the problem formulation is collected to reply to research questions: (1) how are teachers' perceptions of the potential of ICT for students' interest and motivation to learn? (2) how are teachers' perceptions of the advantages of ICT in learning? (3) how are teachers' perceptions of the educational benefits of ICT? and (4) how is the level of teachers' confidence in their ICT competence in learning?

2. METHODS

2.1. Research Design

Survey research with a cross-sectional survey type is applied in this study. This research is a type of observational study comprehensively in a defined population and sample and analyzes variables at a certain time (Mweshi, 2020). Thus, teachers' perceptions of the use of ICT in learning will be produced in the form of a picture of perception when the data is collected. The research was conducted from June to July 2024 at elementary schools in Kebumen.

2.2. Population and Sample

This research was held in Kebumen Regency. Elementary school teachers in Kebumen became the population in this study. The sample was chosen by simple random sampling. A total of 109 elementary school teachers in Kebumen have filled out the questionnaire distributed via Google form. The number of teachers who filled in represented the population in one area (Kebumen). The determination was made by considering the requirements of the sample framework with clear boundaries and no repetition. The following presents the demographic characteristics of the sample.

Table 1. Demographic characteristics of the sample.

No	Aspect		
1	Teaching Experience (Years)		
	0 - 5	:	11
	6 - 10	:	22
	11 - 15	:	12
	16 - 20	:	30
	>20	:	25
2	Age		
	25 - 35	:	25
	36 - 45	:	40
	46 - 55	:	21
	56 - 60	:	14
3	Sex		
	Male	:	29
	Female	:	80
4	School Status		
	Public	:	107
	Private	:	2
5	School location		
	Urban	:	4
	Rural	:	105

2.3. *Instrument*

Data were collected by questionnaire to teachers. The questionnaire instrument was adopted from the research (Parlindungan Pardede & Sunarto, 2020). The adaptation process of this instrument was carried out by only taking four focus items from the six indicators used by previous researchers. There are four indicators determined in this study, namely: 1) the potential of ICT for students' interest and motivation to learn, 2) the benefits of ICT in learning, 3) the educational benefits of ICT, and 4) the level of teacher confidence in their ICT competence in learning. The selection of the four indicators is adjusted to the conditions of ICT integration in Kebumen, such as ease of internet access to the achievements of elementary school students in Kebumen at the provincial level or above. The number of instruments compiled in each indicator has been adjusted to the needs that represent indicators of ICT utilization in learning. The total number of instruments is presented in Table 2.

Table 2. Indicators of ICT utilization in learning.

No	Indicator	Statement Example	Number of statements
1	The potential of ICT on students' interest and motivation to learn	Students show their motivation in learning when teachers use ICT media	5
2	Advantages of ICT in learning	ICT-based learning supports student-centered learning and independent learning.	9
3	Educational benefits of ICT	The use of ICT ensures that the learning process and activities lead to optimal learning outcomes	5
4	Level of teacher confidence in their ICT competence in learning	My competence in using ICT is categorized as high	10

The questionnaire instrument was tested for validity and reliability first. The validity test was conducted using the product-moment correlation test, and a calculated r-test result > r table was produced based on a significant test of 0.05. The validity value of the correlation coefficient is 0.627. This means that all questionnaire statement items obtained good validity interpretation results. Because all question items are said to be valid, all statements are reused for the calculation of the reliability test. The value is adjusted to the validity level criteria in Table 3.

Table 3. Validity level criteria.

Correlation Coefficient	Interpretation
$0.80 < r_{xy} \leq 1.00$	Validity Very Good
$0.60 < r_{xy} \leq 0.80$	Validity Good
$0.40 < r_{xy} \leq 0.60$	Validity Moderate
$0.20 < r_{xy} \leq 0.40$	Validity Poor
$0.00 < r_{xy} \leq 0.20$	Validity Very Poor
$r_{xy} \leq 0.00$	Not Valid

Meanwhile, the reliability of the questionnaire has been tested using Cronbach's Alpha test with a coefficient result (r) of 0.816. Because the reliability coefficient value exceeded 0.700, the questionnaire instrument was reliable and had very high criteria. The results of all statements have obtained a very high level of reliability so that all questionnaire instruments can be used to collect research data. The criteria for the level of reliability are as in Table 4.

Table 4. Reliability level criteria.

Interval	Criteria
< 0.200	Very low
0.200 – 0.399	Low
0.400 – 0.599	Fair
0.600 – 0.799	High
0.800 – 1.000	Very high

2.4. Data Analysis Technique

Descriptive analysis techniques are used to analyze data. The technique uses percentages and average scores. The level of teacher perception is determined according to the average score with intervals. The level of confidence is the probability that states the belief that the interval covers the actual population parameters. The intervals determined in this study are adjusted to the initially determined scale (Likert scale) with a range of 1 to 4. The interval and category benchmarks in this study are as in Table 5 (Chen, Liu, & Wen, 2023).

Table 5. Index of level of agreement, belief, or frequency.

No	Interval	Category
1	3.36 – 4.00	Very High
2	2.72 – 3.35	High
3	1.42 – 2.71	Low
4	0.00 – 1.41	Very Low

3. FINDINGS AND DISCUSSION

3.1. The Potential of ICT to Increase Students' Interest and Motivation to Learn

Motivation is a vital factor in leasrning. This is because it can increase a person's desire to achieve goals (Frydrychova, Kl imova & Poulova, 2014). The existence of motivation greatly affects the learning process of students. Motivation can arise from internal and external factors of students. For example, the use of tools/techniques in learning. In this study, the results of a questionnaire from teachers were obtained about the potential or chance of ICT on student interest and motivation.

Table 6. Teachers' perceptions of the potential of ICT for student interest and motivation.

No	Statement	Average Value	Category
1	The use of ICT in the learning process provides convenience for students	3.82	Very high
2	Students show their motivation in learning when teachers use ICT media	3.80	Very high
3	Students are enthusiastic about learning during ICT-based learning	3.81	Very high
4	Students can hone their skills and insights through the flexible use of ICT	3.73	Very high
5	Learning is more interesting when using ICT media	3.81	Very high

The research findings in Table 6 show that teachers responded positively and had a very high level of agreement with an average value of 3.79 regarding the potential of ICT for student interest and

motivation. This means that students feel an improvement in their interest and motivation after experiencing the usefulness of ICT in learning. Each statement item obtained equivalent results, except for the fourth statement. In this item, the average achievement only reached 3.73, although it is still in the high category. The lower achievement compared to others is influenced by the availability of facilities and infrastructure at school.

In general, this study was responded to by teachers who teach in rural areas. The area is recognized as receiving less attention in terms of facilities compared to schools in urban areas. Furthermore, the family background of students in rural areas is also dominated by families with below-average incomes. The impact is that students are less skilled in using ICT. If students are less skilled in using ICT, then teachers are also less than optimal in utilizing ICT in learning. This is because there is no maximum response from students even though teachers have provided stimulus to students by using ICT in learning.

This discovery is amplified by the teacher's answer through open questions stating that using ICT makes the learning process more interesting. This is what motivates teachers to use ICT in learning. These findings are relevant to the invention of Yusrizal et al. (Yusrizal, Hajar, & Tanjung, 2019) which results in students' interest in learning being higher when they are taught by teachers with high-category ICT competencies. This finding confirms the paradigm that the presentation of learning with ICT media is one of the effective tactics to supplement learning motivation. Learning motivation is demonstrated by students through their performance, such as their passion and hope to successfully achieve goals/targets, the drive and need to learn, hopes and aspirations for the future, forms of self-appreciation, enjoyable activities during learning, and the provision of a conducive learning environment. The existence of ICT arouses students' motivation to learn as a supporter of the success of each student's learning goals. The utilization of ICT-based learning methods can overcome students' passive attitudes because it can increase learning enthusiasm according to their interests and abilities, and allows direct interaction with students contextually.

Utilization of ICT, such as videos, can increase students' learning motivation, especially expectancy components and affective components. The goal is to create a new environment for students by integrating up-to-date learning with current developments. With the application of ICT-based learning media, students can absorb and understand economic learning materials more effectively and in an integrated manner. ICT provides facilities to teachers to make learning more enjoyable and challenging so that monotonous learning is prevented and, at the same time, increases student activity (Frydrychova Kl imova & Poulova, 2014).

The results of this study reflect the urgent need to provide learning facilities. Facilities in schools will greatly help students optimize their interest and motivation in learning. This information can be a consideration for policymakers when creating specific policies on equalizing educational facilities throughout Indonesia. The provision of adequate ICT facilities urgently needs to be addressed by the government as a form of facing global challenges.

3.2. Advantages of ICT in Learning

The utilization of ICT in learning not only has the potential for students' interests and motivations but also provides facilities for other aspects of learning. Many advantages are obtained from ICT-based learning. In this study, ten statements were collected related to the benefits of ICT. The full outcomes are in Table 7.

Table 7. Teachers' perceptions of the advantage of ICT in learning.

No	Statement	Average Value	Category
1	Through the use of ICT facilities, participants can communicate and collaborate	3.72	Very high
2	ICT-based learning can present learning materials that are easily accessible, interesting, and cost-effective	3.74	Very high
3	ICT-based learning supports student-centered learning and independent learning.	3.67	Very high
4	ICT-based learning produces a creative learning environment	3.73	Very high
5	ICT-based learning contributes greatly to the development of critical thinking skills	3.66	Very high
6	ICT-based learning improves the quality of teaching and learning	3.74	Very high
7	ICT-based learning is very helpful in helping to supply learning resources	3.85	Very high
8	ICT-based learning can monitor learning activities	3.67	Very high
9	ICT-based learning increases teacher confidence	3.73	Very high

Table 7 shows that teachers have a very high level of approval with an average value of 3.72 on the advantages of ICT in learning. In general, the results show that teachers are satisfied with the benefits they feel while using ICT. The seventh indicator obtained the highest average value compared to the others. This shows that ICT-based learning has become a provider of the latest learning resources. Currently, teachers are not the main source of knowledge for students. Students need various learning resources to enrich their knowledge and insight. On the other hand, the fifth indicator obtained the lowest results compared to the other indicators. These findings indicate that critical thinking skills are not enough to just use learning media. However, these skills must be optimized in various ways, such as methods, approaches, and learning environments used by teachers.

Teachers have confirmed that ICT is helpful as a means of communication and collaboration, as a presenter of interesting materials, as a media that focuses on student independence, as a media that produces a creative learning environment, as a contributor to critical thinking skills, a provider of learning resources, as a learning monitoring tool, as a means of increasing teacher self-confidence and look up the quality of learning. On the other hand, ICT is viewed by teachers as a means of providing new experiences, knowledge, and skills received by students (Yieng & Daud, 2018). ICT is very useful in obtaining creative communication and learning facilities. These findings are relevant to previous findings where ICT-based learning allows active student involvement so that positive interactions occur which results in high learning achievement (Samith, Guptil, & Russle, 2024).

Full support with the scores listed in Table 7 can be used as further discussion material for teachers to examine more deeply the benefits of ICT in learning. Teachers are recommended to take part in limited ICT training through professional development programs so that they not only feel the benefits. However, teachers should also be able to contribute to the creation of learning tools integrated with ICT. Practical policies by the government can also be specified for elementary school teachers so that teacher training programs are carried out evenly. The low levels of several indicators (such as indicators 3, 5, and 8) also need to be improved by teachers so that the benefits of ICT can truly be optimized in all areas needed by teachers to improve the quality of technology-based learning.

3.3. Educational Benefit of ICT

Educational benefits relate to the benefits of ICT for the overall process of improving knowledge, skills, and attitudes needed by students in the future. This is because the goal of national education is

to organize students so they become successful people in the future with educational practices that follow the background of students. The use of ICT is very useful for synchronizing with the situations and needs of students and society (Busse, 2011). The major pedagogical potential makes ICT support greatly the development of effective educational processes (Jamieson-Proctor et al., 2013).

In this study, data on the educational benefits of ICT are presented. There are five statements submitted to teachers. The full outcomes are in Table 8.

Table 8. Teachers' perceptions of the educational benefits of ICT.

No	Statement	Average Value	Category
1	Socio-cultural conditions and student needs are not in line with the utilization of ICT	3.36	Very high
2	There is a guarantee of optimal learning outcomes in the learning process after utilizing ICT	3.55	Very high
3	ICT is not optimal for developing student independence in learning	3.39	Very high
4	ICT enhances interactive and collaborative learning experiences	3.72	Very high
5	ICT is effective in aligning 21st-century educational practices	3.84	Very high

Table 8 shows that teachers responded positively with a very high level of agreement, with an average value of 3.57, regarding the educational benefits of ICT. The most dominant statement according to the table, is seen in the fourth item. The statement states that ICT is in line with 21st-century education practices and enhances interactive and collaborative learning experiences. These results are reinforced by looking at the demographic distribution of teachers who filled out the questionnaire. The teachers are dominated by teachers who are civil servants and are located in public schools. Furthermore, teachers are also dominated by teachers who are under 40 years old. Thus, these results are relevant to the existing demographic context.

Young teachers are considered more skilled in using IT than older teachers. Most teachers have been able to adapt to the increasingly rapid development of technology. These competencies or abilities are innate and provisions for teachers to adapt to the competencies needed in 21st-century education. In addition, teacher abilities can also create interactive and collaborative learning experiences for students. Easy internet access makes it easy for teachers to teach students via mobile phones. Information from various parts of the world about subject matter with teachers or students seems to be without distance. This indicates that everyone can easily get information from anywhere and anytime.

On the other hand, the first statement item obtained the lowest results. This shows that not all learning technologies are following the culture of the people in Indonesia. Some regions have customs and rules that are believed by the community. These beliefs can be the reason for the incompatibility between technology and socio-cultural conditions in Indonesia. Kebumen Regency is also one of the regions known for its customs.

Furthermore, the respondents in this study taught in local or rural areas that are thick with their culture. This is different from urban areas that tend to be increasingly apathetic towards regional culture. Therefore, elementary school teachers in Kebumen also consider the culture in their teaching environment. These considerations lead to "Is the technology used also approved by the parents of students?", "Can the benefits of technology also be felt by the parents of students?", and other considerations. Nevertheless, these findings contribute positively to science. Data has proven that ICT is educationally beneficial. Teachers and principals can raise similar topics in an internal meeting or be brought into the scope of a discussion between teachers in one sub-district to share information about the educational benefits of ICT from various regions. This is because each region has different

characteristics or cultures. Thus, this information can be applied by teachers in other areas to experience the same benefits of ICT.

This finding is supported by research reports that explain that ICT is effectively used to align learning practices that are appropriate to the conditions and needs of 21st-century competencies (González-Salamanca, Agudelo, & Salinas, 2020). Other research shows that ICT facilitates teachers widely to merge elements of time, space, and humanity effectively so that the learning process is guaranteed to achieve maximum learning objectives (Balash, Yong, & Bin-Abu, 2011). Other findings that support this research conclude that the use of ICT has been proven to increase interactive and collaborative learning, as well as student independence (Frydrychova Kl imova & Poulova, 2014). The ICT approach provides opportunities for interactive and real-time information delivery, as well as the availability of learning activities that maximize previous learning arrangements (Dalimunthe, 2024).

3.4. Level of Confidence in Mastery of ICT Competencies

ICT competency refers to the user's skills and knowledge to utilize ICT hardware and software and complete other specific tasks. The stage of teacher confidence in ICT competency plays a role in ICT integration (Mwendwa, 2017). Comprehensive and up-to-date ICT improvements in schools will not be able to be used if teachers do not have ICT competency. There are reports about teachers and students needing to master ICT competency skills in learning (Olasina, 2012).

In this study, ICT competencies include several types, namely the frequency of ICT use, competency in using ICT in learning, and the availability of ICT facilities and training as supporting teacher competencies. The full outcomes are in Table 9.

Table 9. Teachers' perceptions of ICT competency mastery

No	Statement	Average Value	Category
1	I am used to using ICT media in learning	3.35	Very high
2	I use ICT media in learning once a week	3.17	High
3	I rarely use ICT media in learning	3.25	High
4	My competence in using ICT is categorized as low	3.28	High
5	My competence in using ICT is categorized as high	3.20	High
6	I use ICT media in learning if there will be supervision	3.36	Very high
7	I need help in making ICT media	3.28	High
8	The availability of ICT facilities in schools is limited	3.20	High
9	ICT training for teachers is limited	3.20	High
10	I have my laptop/computer	3.61	Very high

Table 9 shows that teachers responded positively with a high level of agreement with an average value of 3.29 towards mastery of ICT competencies. Each statement has a different level of agreement. Seven statements received responses in the high category. The second statement received the lowest average score compared to the others. The statement illustrates that teachers use ICT once a week. This number is certainly very small compared to the importance of using ICT in learning. Worse, some teachers stated that they never use ICT in learning.

These results correlate with other statements. Some of them are statements about teacher competence in using ICT. Teachers aged (40-65 years) describe themselves as lacking competence in using ICT. As in the fourth statement about the low ICT competence of teachers, it was agreed with an average score of 3.28 or a high category. Another statement also illustrates that the use of ICT media will only be used if there are supervision activities from the principal or school supervisor. This indicates that ICT has not fully become an urgent need for teachers because it is only done at certain times. Although teachers already have their own computer devices, most teachers do not use these

devices as learning media. If teachers only use ICT with rare intensity, then their competence in using ICT is also lower.

In this study, several teachers have used ICT because the availability of ICT facilities in schools is adequate. However, there are some teachers who still rarely use ICT in learning. The development of teachers' ICT skills can be done by their participation in ICT training programs (Samith et al., 2024). Teachers have also received ICT training from schools and sub-district levels. However, the training has not had a significant impact on teachers because most of the training received has not focused on the use of ICT, for example focusing on inclusive education, teaching materials, the latest version of government books, and others. Based on these findings, special training or ongoing professional development programs are recommended for elementary school teachers in Kebumen. The frequency of ICT integration in learning needs to be increased. Through teacher training, teachers become more open in facing the challenges of today's digital developments.

These findings are relevant to previous results which found that ICT mastery is positively correlated with the ICT competence of elementary school teachers. Teachers who have ICT mastery are also followed by their high ICT competence. Teachers are advised to optimize their skills in utilizing information technology. Teachers should already be operationalizing their work with ICT devices. These results are reinforced by the findings of Safihu, Bundu, and Gani (2022) that ICT has a big impact on teachers, especially in managing problems that include learning. The results are also relevant to the findings of Yusrizal et al. (2019), who found that the competence of primary school teachers in the use of ICT is included in the moderate category. These results are the impact of the demands on teachers to master technology. Technology is a factor that influences the realization of optimal learning quality.

4. CONCLUSION

Based on the findings, this study concludes that elementary school teachers hold positive perceptions of the integration of information and communication technology (ICT) in learning. Teachers recognize ICT's potential to enhance student interest and motivation, acknowledge its general and educational benefits, and express confidence in their ICT competence. These findings have practical implications, encouraging teachers to adopt ICT more consistently in classroom instruction. They also highlight the need for local education policymakers—particularly at the district level—to address ICT-related disparities by improving infrastructure and providing professional development programs focused on ICT integration. However, this study is limited by its cross-sectional design and narrow focus on elementary school teachers in a single region, which may not capture evolving perceptions or be generalizable to other educational levels. Future research should consider longitudinal approaches to track shifts in teacher attitudes over time, as well as employ qualitative or comparative methods to gain deeper insights into the challenges and best practices in ICT integration. Overall, this study contributes to the understanding of ICT's role in shaping effective, modern educational practices aligned with 21st-century learning demands.

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