

ANALYSIS OF INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT) COMPETENCIES OF PRIMARY SCHOOL TEACHERS

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Abstract. Information and Communication Technologies (ICT) competencies need to be mastered by teachers in organizing learning in the current technological era. However, based on data, there is still a technology gap both in terms of teachers and facilities and infrastructure. This research is focused on (1) knowing the general picture of elementary school teacher competence, (2) knowing the picture of teacher ICT competence based on four derivative levels of ICT competence, and (3) knowing the influencing factors in improving ICT competence. This research used a descriptive method with survey techniques involving 70 randomly selected elementary school teachers. The findings from this research illustrate that: (1) as many as 67% of teachers can integrate ICT into the learning process. (2) Analysis of the derived levels of ICT competency shows that the ICT Literacy level is an aspect that many teachers master, followed by the level of ICT implementation, ICT creation, and finally the level of ICT sharing and collaboration. (3) influencing factors in mastering ICT competencies: age, continuous training, facilities and infrastructure, and motivation.

Keywords: Information and Communication Technology (ICT), elementary school teacher competency, training.

INTRODUCTION

Information and communication technologies (ICT) which continue to develop have brought extraordinary changes to the education system. Computer-based learning (CBI), web-based learning (e-learning), computer-assisted learning (CAI), and AVA-based learning are forms of utilizing ICT that need to be implemented in the world of education today (Rusman et al., 2011). This of course causes the emergence of new jobs that require human resources who can master technology. Technological developments are an increasingly massive issue in the world of education today. Therefore, the link between education and technology needs to be developed in every educational institution so that it can produce technologically competent graduates. The development of ICT mastery is of course not only in certain subjects, but now ICT needs to be integrated in every subject so that students can be trained to become agile, adaptive, and active learners with technology.

Integrating ICT into the learning process is included in one of the learning principles to increase the efficiency and effectiveness of learning (Permendikbud, 2016); (Syahid et al., 2022). Utilizing ICT in it is something wise to do now as an effort to improve the quality and quantity of education (Juliane et al., 2017). The integration of ICT in the learning process certainly needs to be supported by several factors such as human resources, facilities and infrastructure, supporting policies, and also financial sources. It cannot be denied that until now there is still a technology gap in Indonesia. For example, access to technology is not evenly distributed across regions, which can result in poor education quality, an uneven distribution of ICT-skilled teachers, and generational differences in schools and society as demonstrated by digital natives and digital immigrants. Another thing that is an obstacle to integrating ICT into learning is that there are parties who do not want to accept the presence of technology with the assumption that technological developments will threaten cultural preservation. Seeing this phenomenon, the government and educational institutions have an

important role in increasing the integration of ICT in learning so that they can provide quality education while still maintaining the existence of local culture.

The success of ICT integration into the classroom will depend on the teacher's ability to organize the learning process, starting from preparing ICT-integrated strategies, combining ICT with new pedagogical capabilities, and holding active, cooperative, and collaborative classes. This of course requires a different set of classroom management skills guided by a teacher who has competence in mastering ICT. Undang-Undang (UU) No 14 of 2005 Concerning Teachers and Lectures Article 4 emphasizes that teachers as learning agents function to improve quality. national education, so that to be able to carry out their functions well, teachers are obliged to have certain requirements, one of which is competence. The development of teacher competence in the field of ICT is strengthened in the 2020-2024 National Medium Term Development Plan (RPJM) which is emphasized in the fourth Ministry of Education and Culture priority, namely technology development. One thing that needs to be done is the development of information and communication technology (ICT) which is carried out through the use of ICT in the education sector which includes the role of ICT as an educational substance, learning aids, educational facilities, competency standards, educational administration support, educational unit management tools, and educational infrastructure (Adisel & Pranansa, 2020).

ICT competency is a competency that teachers need to master. Teachers' ICT competence is an important element of modern teacher qualifications (Ravshanovna, 2021). Teachers need to have support and readiness to integrate ICT into the world of education (Buabeng-Andoh, 2012; Dela Fuente & Clarito Biñas, 2020). This ICT competency includes a series of skills, knowledge, and attitudes (Hämäläinen et al., 2021). UNESCO has developed an ICT for teachers framework as a guide for each country in developing training to improve teachers' ICT competency which consists of three levels of proficiency, namely; 1) Knowledge Acquisition (ICT knowledge acquisition); 2) Knowledge Deepening (deepening and engineering knowledge through ICT); and 3) Knowledge Creation (having the ability to create knowledge using ICT) (UNESCO, 2018).

In developed countries, ICT in education is an important thing that cannot be denied and has had a significant positive impact (Marcial & De La Rama, 2015), therefore every country develops training programs that can improve teachers' ICT competency. The United States established a national ICT integrated training for teachers in 1995, with the main objective of this training to enable the use of Technology in facilitating school improvement in the United States by increasing teacher competency in four main categories: prerequisite technical skills, technical skills, instructional usefulness, and the professional role of teachers (Moore et al.;1999); (Usun, 2009). Then the UK established the New Opportunities Fund (NOF) training for all teachers in the UK to let teachers know what computer-based resources (including the Internet) are available for the subjects they teach and how they can be used with whole classes, groups, and individuals. Similar to America and England, Japan integrated ICT into the new curriculum in 1989 so that teacher training is designed for both pre-service and in-service teachers (Hayashi, 2003); (Usun, 2009). National ICT training in Indonesia was initiated by the Ministry of ICT Competency Development and was held by the Ministry of Education and Culture, Research and Technology (Kemendikbud Ristek) in 2017 under the name of ICT-Based Learning training (PembaTIK) which developed an ICT competency framework for teachers from UNESCO. ICT-based training during and after the pandemic began to be massively promoted both through government institutions and private institutions to help teachers be able to carry out distance learning using ICT tools.

However, the development of teacher ICT competency in Indonesia based on several kinds of literature still needs to be improved, based on reports (UNICEF, 2020) that 67% of teachers report problems with operating devices and using online learning platforms. Then in 2021, the Ministry of Education and Culture (Kemendikbud) (Makdori, 2021) revealed that 60% of teachers in the country still had limited abilities in mastering Information and Communication Technology (ICT). Following the opinion of Darmawan (2011) the main cause of the lack of development of ICT implications in Indonesia is the lack of availability of human resources. In fact, according to the Director General of Early Childhood Education, Basic Education and Secondary Education, Ministry of Education and Culture, Jumeri, Indonesia requires superior human resources (HR) to achieve human development targets in the 100th year of this country's independence in 2045. The cause of not developing teacher ICT competence can be due to several obstacles such as lack of teacher experience, lack of collaboration and support among colleagues (Ertmer & Ottenbreit-

Leftwich, 2010; Dela Fuente & Clarito Biñas, 2020), as well as lack of time to master the integration of ICT skills in education (Almekhlafi & Almeqdadi, 2010; Dela Fuente & Clarito Biñas, 2020). part from that, there is still a lack of teacher access to technology which can create educational gaps.

Teacher competence is of course very necessary to be able to deliver and implement learning by curriculum objectives. Moreover, the independent curriculum launched by the government currently emphasizes the integration of technology, by launching technology-based programs to build a digital ecosystem for learning teachers such as the independent teaching platform (PMM), education report cards, and access to belajar.id education services (BLPT, 2023), apart from that, the newest platform launched in December 2023 is the teacher performance platform. This certainly strengthens ICT competency as one of the competencies that teachers need to master today.

The new normal era is a time where education becomes more flexible, and can be accessed anywhere and anytime. Therefore, in providing education that can keep up with current developments, teachers should need to master ICT competencies. There has not been much research regarding post-pandemic teacher ICT competency, especially for elementary school teachers. Therefore, researchers are interested in conducting investigations and collecting empirical evidence to assess teachers' ICT competency to obtain references for designing ICT program interventions that are in line with Indonesia's educational goals. Based on the background explanation above, this research is directed at (1) knowing the general picture of elementary school teacher competence, (2) knowing the picture of teacher ICT competence based on four derived levels of ICT competence, (3) knowing the influencing factors in improving ICT competence.

RESEARCH METHOD

The method used in this research is a survey method with descriptive analysis techniques. The choice of method was based on the research objective, namely to capture the ICT competency of elementary school teachers. The questionnaire used was adapted from the ICT training curriculum of the Ministry of Education and Culture, Research and Technology (Kemendikbudristek). The survey was conducted on 70 elementary school teachers in the Bekasi Regency area. Sample selection was carried out by random sampling with various sample categories. Details of the research sample are listed in Table 1.

Table 1. Research Sample

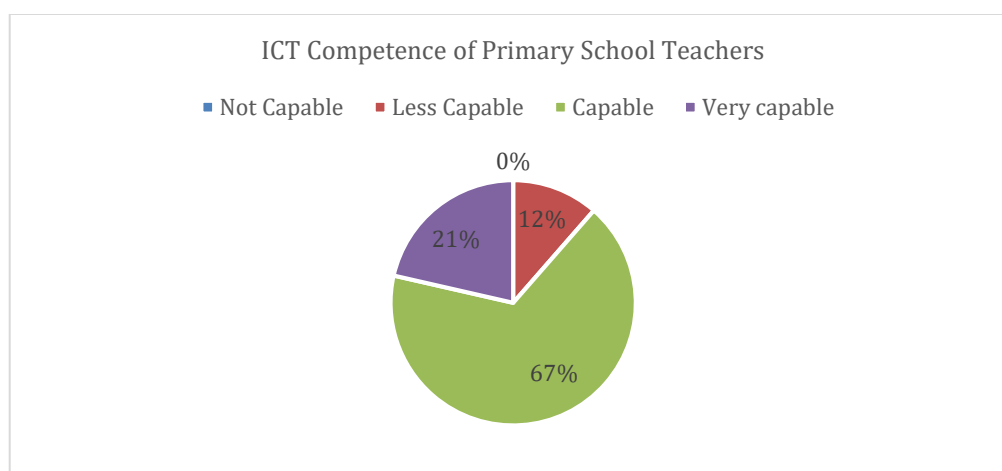
School Origin	Gender	Age	Teaching Experience	Last Education
Public School (35 people)	Male (20 people)	11-26 years/ Gen Z (5 people)	< 7 years (23 people)	Senior High School (4 people)
Private School (35 people)	Female (50 people)	27-42 years /Gen Y (49 people)	8-14 years (20 people)	D3 (1 people)
		43-58 years /Gen X (5 people)	15-21 years (22 people)	S1 (59 people)
			22 years < (5 people)	S2 (6 people)

Data collection instruments were questionnaires and interviews. Interviews were conducted with several respondents for testing as well as confirming and exploring additional information from the answers to the questionnaire. Analysis of questionnaire answers was carried out using descriptive statistical techniques to see the dominant answers from respondents to find the teacher's ICT competency level.

RESULT AND ANALYSIS

1.1 Teacher ICT Competency

Education reform in the new normal era presents new habits in the world of education that encourage the creation of a more massive integration of technology. Teacher ICT competency is the teacher's ability to integrate ICT into the learning process. The first findings related to teachers' ICT competency in general are visualized in Figure 1. It shows that as many as 21% of teachers said they were very capable of using ICT, 67% said they were capable, and 12% said they were less capable. Based on Table 1, 70 people participated in this research, around 13 people said they were very capable of mastering ICT, 47 people said they were capable, and 8 people said they were less capable. With an average competency score of 75, it shows that school teachers' ICT competence what basis is at the capable level.



Source: processed by researcher

Fig. 1. Primary School Teacher ICT Competency Based on Ability Level

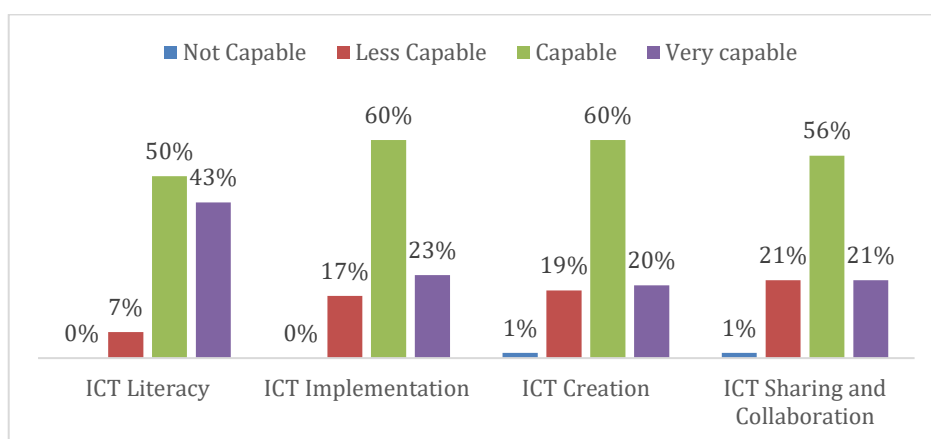
In the current Merdeka curriculum era, the government emphasizes the digitalization process of education, such as the existence of online platforms for training and developing teacher competencies, education report cards, and teacher performance assessments, which means that teachers must be competent in mastering technology. The role of teachers can never be separated from the process of educating students who live side by side with digital devices it has become a primary need. Therefore, teachers play a role as role models in transmitting material, assignments, and discussion space with students (Syahid et al., 2022).

In this study, the percentage of teachers who were able to master technology was greater than in previous research, such as reports (UNICEF, 2020) that 67% of teachers reported problems with operating devices and using online learning platforms. Then in 2021, the Ministry of Education and Culture (Kemendikbud) (Makdori, 2021) revealed that 60% of teachers in the country still had limited abilities in mastering Information and Communication Technology (ICT). This could be because teachers are accustomed to using ICT devices and digital platforms during the learning process, as a result of technological reforms in the world of education during the Covid-19 pandemic, which requires distance learning and blended learning processes. In distance learning, teachers, students, and parents have to adapt to technology in a short time. Various methods are used by educational institutions or teachers so that the distance learning process can run well, such as implementing online learning by utilizing several technologies such as YouTube, Google Meet, and Zoom applications (Nurlatifah, 2022). Blended learning is a combination of face-to-face learning and e-learning/online learning. Mixed learning or blended learning emerged as a response to inevitable technological developments (Mulyadi, 2021).

Apart from that, the proliferation of ICT-based offline and online training organized by government institutions or private institutions, NGOs, or teacher organizations, is one of the factors that helps teachers improve their competence in mastering ICT. Such as teacher training and

mentoring in the field of ICT (Noviati et al., 2020), e-learning (Rahmi & Hidayati, 2020), training in making ICT-based learning evaluations (Wardoyo & Nuris, 2023), training in making digital teaching materials (Matondang et al., 2023), as well as literacy training and cloud storage applications (Sucipto et al., 2023). The results of the training show that during the training process, there was an increase in teacher competency as seen from the aspects of knowledge, skills, and attitudes in using ICT, both manual and digital systems. Apart from that, teacher enthusiasm and participation in training are included in the high category. The existence of a mentoring program after the training has had a positive impact on the development of teacher competence in integrating ICT into the learning process. In addition, with training and a supportive community, teachers can collaborate and exchange ideas regarding solving problems that occur in the classroom related to ICT integration. An increase in teacher competence will certainly have an impact on the quality of learning. Quality education will depend on human resources who play a role in implementing learning. By research (Trisnawati et al., 2022) there is a positive relationship between teacher ICT skills and student learning outcomes. Many studies have confirmed that ICT improves procedural efficiency, and the quality of ICT services can also benefit teachers, encourage learning, and improve learning outcomes, especially at the primary and secondary school levels (Abad, 2020); (Suroya, 2021). Current technological advances have shown developments in the future where the need to use ICT in education can no longer be avoided, therefore preparing teaching staff to achieve usage readiness will also have an impact on student readiness (Widiara, 2018).

1.2 Teacher Competency Based on ICT Competency Level



Source: processed by researchers

Fig. 2. Teacher ICT Competency Based on Level.

Based on the ICT competency framework developed by the Ministry of Education and Culture, it consists of four levels of derivative competencies, namely ICT literacy competency, ICT implementation, ICT creation, and ICT sharing and collaboration.

1.2.1 ICT Literacy Level

Literacy is the basis of a lifelong learning process. Literacy is also a skill needed in the 21st century. ICT literacy is the ability to use ICT to find information, assess, process, use/create, and communicate information (Yazon et al, 2019; Rahman et al., 2021). Meanwhile, in the concept of 21st-century skills, ICT literacy is the ability to utilize information and communication technology to improve performance and daily activities (Abdulkhak & Riyana, 2017). According to UNESCO (2018), literacy needs to be mastered by teachers to support the implementation of relevant curricula, provide more knowledge for teachers so they can consider when is the right time to use technology, and know how to use technology according to student characteristics.

In Figure 2. As many as 43% of teachers are very competent at the ICT literacy level, 50% of teachers are in the capable category, and 7% teachers are in the less capable category, with an average teacher competency score of 79 which is included in the capable category. ICT literacy is related to two things, namely: (1) ICT basics which include knowledge of concepts and

understanding of theoretical principles about computers, information systems, and digital information. (2) Understanding and skills in using ICT equipment, such as processing numbers and words (Santoso & Lestari, 2019). Research related to ICT literacy shows that increasing ICT literacy for teachers can be done by providing training, providing facilities, and conducting comparative studies (Rahman et al., 2021). ICT literacy can be improved through an independent learning process, attending training, sharing with colleagues, and increasing experience in using ICT tools. To create technology-based learning, teachers must master the literacy of the technology itself (Darmawan, 2018; Purnasari & Sadewo, 2021)

1.2.2 Implementation Levels

ICT implementation is the process of implementing the use of ICT in the learning process. ICT implementation survey data visualized in Figure 2 shows that 23% of teachers are in the very capable category, 60% are capable, and 17% are less capable, with an average of 74 being in the capable category. When compared with the literacy level, at the implementation level there was a decrease in the average score but it was still in the capable category.

According to UNESCO, ICT implementation is the process of teachers identifying the best way to use ICT that supports authentic learning and possibly connects the real world with problems related to the environment, food security, health, and other things that are in line with curriculum objectives. Based on Barubara's (2017) findings, several aspects of teacher ICT competency that are of concern are mastery of ICT tools, understanding the design of developing teaching materials using ICT, and methods of using ICT tools in the classroom. The implementation process certainly requires support from various other factors such as teacher knowledge and supporting infrastructure. The information obtained by researchers is that teachers' knowledge and understanding regarding how to integrate ICT is acknowledged to be still low due to the lack of training provided by institutions, apart from that the availability of facilities has also become a polemic in itself, such as ICT equipment and the quality of internet access. The implementation of training programs such as those carried out by (Rahmi & Hidayati, 2020) shows that teachers are increasingly ready to integrate ICT into learning and teachers are also able to design and create learning activities using technology. The availability of facilities and infrastructure is of course a very urgent matter in supporting the integration of ICT in the learning process. The finding (Noviati et al., 2020) is that one of the obstacles for teachers in improving their competence is related to ICT-based communication infrastructure which is still limited, especially the availability of laptops, and the absence of projectors in each class.

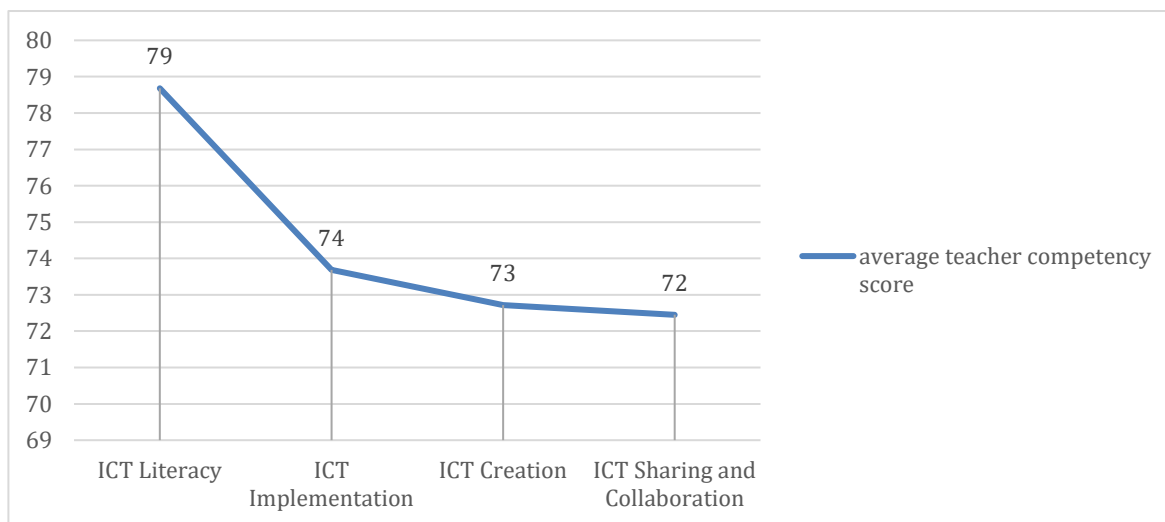
1.2.3 Level of ICT Creation

The creation level focuses on the teacher's ability to create and also find solutions to problems that arise in ICT integration. Apart from that, ICT creation also directs teachers' ability to use ICT in project-based learning which aims to stimulate students to solve problems and collaborate by utilizing ICT. Based on the results of the data visualization in Figure 2, 20% of teachers are in the very capable category, 60% are capable, 17% are less capable, and 1% are not capable, with an average of 73 being in the capable category. At this level, teachers are not only able to design class activities that are limited to achieving predetermined goals but also able to develop programs that are beneficial to the school and the surrounding environment in a sustainable manner. At this stage, teachers do not have to focus on the interests of the curriculum but also need to pay attention to the impact on society by utilizing ICT. Therefore, the level of ICT creation emphasizes the emergence of problem-solving, communication, collaboration, experimentation, and critical creative, and expressive thinking abilities.

One of the obstacles in creating ICT is that teachers have not been trained in solving ICT-based problems, and there is still minimal training provided regarding integrating ICT into project-based learning. Vilppola et al. (2022) argue that teachers' ICT competence is supported by the active use of ICT and through experimentation with ICT software and ideas conveyed by instructors during the training process. The findings of Wardoyo & Nuris (2023) in several vocational schools in Tuban Regency show that many ICT-supporting facilities are underutilized by teachers in accounting learning. The accounting learning media and learning evaluation tools only use Microsoft PowerPoint. The teacher's ability to use the Microsoft PowerPoint program can be developed or processed into learning media in the form of interactive multimedia.

1.2.4 Level of ICT Sharing and Collaboration

Sharing and collaborating competency is a process where each teacher shares the results of their creations and also collaborates in forming or planning ICT-based learning. The COVID-19 pandemic certainly requires teachers to organize ICT-based learning, both from creating materials, discussions, and even the assessment process. However, this has not been able to make teachers confident and capable of mastering ICT competencies. Based on survey data on the level of sharing and collaboration, 21% of teachers are in the very capable category, 56% are capable, 21% are less capable, and 1% are not capable, with an average of 72 being in the capable category. The process of sharing and collaborating can be done by sharing teachers' good practices using technology. With sharing and collaboration competencies, it is hoped that teachers will not only be able to apply the use of technology in learning and teaching activities but also in sharing innovative works in learning (BLPT, 2023). Collaboration has the potential to become the main grassroots driver of educational change (Barfield, 2016); (Kasmawati, 2020). When effective collaboration occurs, teachers' knowledge and experiences are shared and teaching is improved. The experience gained from collaborative activities will change teachers' knowledge, attitudes, and beliefs and result in permanent and substantial improvements in teaching instruction (Samaranayake et al., 2018). Apart from that, collaboration carried out professionally can build experience, pedagogy, and content knowledge (Goddard et al., 2007); (Kasmawati, 2020).



Source: processed by researchers

Fig. 3. Average teacher competency score

Based on the average distribution per level in Figure 3, it can be seen that the ICT Literacy level is an aspect that many teachers master, followed by the level of ICT implementation, ICT creation, and finally the level of ICT sharing and collaboration. With the overall score per level being in the capable category.

1.3 Factors on Teacher ICT Competence

The development of teacher competency needs to be supported by various aspects such as the availability of facilities and infrastructure, training, and teacher motivation. Based on information from sources obtained by researchers, some of the influencing factors are teacher age, facilities and infrastructure, training, and motivation.

1.3.1 Age

The respondents of this research consist of three generations, namely Age is predicted to be an influential factor in teachers' mastery of ICT competency because they assume that younger teachers (generation Y and Z) have lived and been raised in the technological era, so they are more

adaptable in mastering technology, in contrast to generation X who tend to be just getting acquainted with technology. when he entered the professional world. Based on data (Komag & Astini, 2019) in Semarang City, 20% of elementary school teachers still lack the use of IT (information technology), this is due to the age factor. Many of them are still confused about using IT. One of the challenges in the world of education in integrating technology is the gap between the current generation of students and the generation of teachers who teach. Teachers who incidentally belong to the old generation who were born and developed not in the technological era, whereas now the students who need to be educated are the generation who use technology all the time in their lives. It is feared that the generation gap will cause a mismatch in the implementation of learning with current learning challenges and student needs. Of course, this needs to be responded to seriously, both from the teacher's side as someone who has direct contact with students and from the institution concerned so that the learning process can be in line with current technological developments.

1.3.2 Facilities and Infrastructure

Facilities and infrastructure such as the availability of ICT devices and also internet access are things that need to be provided by institutions or individuals as a tool to improve teacher competency. Infrastructure allowances are also very important when it will be easy to access training yourself using ICT. Apart from that, in the current digital era, internet quality is also very necessary, so infrastructure facilities both in private institutions and abroad really need to be paid attention to. Based on research reports (Budiana & Sjafirah, 2015) a real picture of the condition of education in rural areas can be seen at Kawali 2 State Junior High School (SMP), it can be seen that teachers experience difficulties in implementing Information and Communication Technology (ICT) in the teaching and learning process at their school. This is due to the lack of infrastructure, including computer laboratories, internet networks, and teachers' mastery of ICT itself. In developed countries, the ICT facilities and facilities used to support their needs (including for educational purposes) are very advanced and modern (sophisticated). Their target is students with the aim that they are intelligent, have a personality, and are ready to face all the challenges of the times (Lestari, 2015).

1.3.3 Training

Teacher training is the most important factor in increasing teacher competency. With training, teachers have the opportunity to learn and practice. Of course, training programs need to be facilitated by government agencies or private institutions, both for pre-service and in-service teachers. ICT training needs to be designed sustainably, with continuous training teachers have a lot of time or space to express themselves and train themselves to update their abilities in mastering ICT. Pre-service education is not enough for teachers to be able to handle their employment issues for the rest of their lives; rather, they require ongoing professional development and support, a greater challenge arises not when teachers undertake training, but when teachers try to apply what they learn in real classrooms (Abuhmaid, 2011). Vilppola et al. (2022) argue that the thing that can limit the development of teachers' ICT competence is the lack of time teachers have to improve their abilities. However, currently, a lot of teacher training is being carried out online, so it can be a solution for teachers who don't have a lot of free time but have a strong desire to increase their competency. The use of technology is very necessary for the classroom, so teachers also need training in digital skills to increase their competence in mastering ICT. The related review by Kay (2006); (Sang et al., 2010) summarizes key strategies to introduce technology to pre-service teachers: delivering a single technology course; offering mini-workshops; integrating technology in all courses; modeling how to use technology, etc.

1.3.4 Motivation

Motivation is a factor that also needs to be considered because motivation is an incentive for individuals to want to learn. One example of the motivation provided by an institution can be, for example, borrowing funds to buy a typewriter for an individual and then providing a reward for individuals who have completed the training, or keyboards for teachers who have innovations in the field of ICT in the learning process. Motivation can be expressed in the form of a willingness to take part in training or develop oneself independently. Lestari (2015) believes that the obstacles to teachers' use of ICT are: lack of access, lack of ICT facilities, learning not integrating ICT, teachers not having knowledge about ICT, and teachers not being willing to use ICT.

These four aspects are the aspects that are considered to be the most influential in mastering ICT competencies for teachers, while work experience and educational qualifications are considered to be less influential, this is due to the increasing length of teacher experience, indicating that the teacher is an old teacher who falls into the generation group. X tends to experience many difficulties in mastering ICT. Based on research findings (Dela Fuente & Clarito Biñas, 2020) age, gender, and educational background do not have a significant influence on teacher ICT competence. This is in line with research (Tondeur et al., 2018) The ICT competency of pre-service teachers for educational practice was unaffected by age or gender. Additionally, the findings showed that pre-service teachers' perceptions of ICT (in education) and its usability had a favorable effect on their ICT competency for instructional practice. The experience that can increase teachers' ICT competence is experienced in applying ICT in the learning process (Mohammed Badau & Sakiyo, 2013), the more frequently teachers integrate ICT in learning, the more teacher competence in mastering and solving problems related to ICT will increase.

Educational qualifications also do not guarantee that teachers have sufficient competence in ICT, however, as educational qualifications increase, there are more opportunities to learn and come into contact with the world of ICT compared to high school graduate teachers. Based on research by Barubara (2017) it is explained that two types of factors affect how competent a teacher is at using ICT for learning: factors that originate from within (internal) and those that originate externally from the instructor. The factors that originate from within the teacher himself (internal) are: 1) the teacher's attitude in accepting changes and developments in learning models, 2) the teacher's level of mastery of various ICT tools, 2) the teacher's perception of the role and function of ICT in schools, 3) teacher initiative for independent and collaborative learning, and 4) teacher self-confidence in facing various challenges. According to opinion (Ertmer, 1999; Hur, Shannon, & Wolf, 2016; Pittman & Gaines, 2015; Cheng et al., 2020), there are two levels of barriers that influence teachers in integrating technology into the classroom, first-order barriers to technology integration are obstacles external to teachers that can constrain teachers' technology use, including the lack of school resources, time-tabling, or limited administrative support (Hew & Brush, 2007; Hew & Tan, 2016). Second-order barriers are obstacles intrinsic to teachers, such as teachers' beliefs about teaching and learning or technology use in classrooms (Ertmer, OttenbreitLeftwich, & Tondeur, 2015; Kim, Kim, Lee, Spector, & DeMeester, 2013; Cheng et al., 2020).

CONCLUSION

Based on the research results, it can be concluded that information and communication technology (ICT) has become an integral part of people's daily lives, especially in the educational context. as many as 67% of teachers have ICT mastery in the capable category. Of the four levels of ICT competency seen from the average, the ICT Literacy level is the aspect that most teachers master, followed by the level of ICT implementation, ICT creation, and finally the level of ICT sharing and collaboration. This gap shows the need for more attention to improving ICT competence for teachers, especially skills in using complex ICT tools and their integration into innovative learning. Therefore, further evaluation is needed, especially by stakeholders, to determine the appropriate steps in improving teacher ICT competency, and the existence of continuous training programs initiated by each educational institution or institution authorized to increase teacher competency can be a solution to improve ICT competency. It is hoped that this can make a positive contribution to overcoming the ICT competency gap that still exists among teachers, which will also have an impact on improving the quality of ICT-based learning in the era of the independent curriculum.

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