Technology, Information, and Communication (ICT) Literacy in Mathematics Learning in the Digital Age

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Abstract: This study aims to describe the role of technology, information, and communication (ICT) literacy in learning mathematics and identify the factors that influence ICT literacy. The research method used is a descriptive survey method. The results of the study show that : (1) ICT literacy has an important role in learning mathematics: making learning media, finding learning resources in making teaching materials, carrying out the learning process, and making learning administration, as well as assessment activities. (2) Factors that influence ICT literacy consist of: training effectiveness, visionary leadership, work-life balance, achievement motivation, facilities and infrastructure, initial capabilities, and organizational culture. The conclusions from this study: (1) ICT literacy is very important in learning mathematics. (2) The dominant factors influencing ICT literacy, namely: training effectiveness, visionary leadership, work-life balance, and achievement motivation.

Key Words: ICT Literacy, Mathematics Learning, Digital Age.

Introduction

Education is a very important component in the progress of a country, especially the development of human resources. This is in accordance with the goals of national education stated in the Law of the Republic of Indonesia number 20 of 2003 article 3 namely National education functions to develop capabilities and form dignified national character and civilization in the context of educating the nation's life, aiming at developing the potential of students to become good human beings. believe in and fear God Almighty, have noble character, be healthy, knowledgeable, capable, creative, independent, and be a democratic and responsible citizen. So that education must get special attention from both the government and society so that the quality of education in Indonesia is good. Education is the most powerful weapon in dealing with or adapting oneself to the times (Lisgianto and Suhendri, 2021:107).

In the digital 4.0 era, the world of education applies or implements information and communication technology (ICT) in the learning process. The rapid development of technology in the 21st century requires society to be more adaptive so as not to be left behind in all fields. One important field is education (Lisgianto and Suhendri, 2021:107). Implementation of learning must apply ICT both planning, process, and evaluation. Helaludin (2019: 53) that in welcoming the 21st century, the presence of information and communication technology (ICT) in the field of education is indeed inevitable. Almost all elements of education and learning are carried out by applying ICT in them.

In reality on the ground, there is still a lot of learning in the classroom that has not applied ICT. This is because there are still many teachers who have not mastered ICT literacy. There are still many teachers who do not have the necessary skills in information technology and they also do not have the special training needed to be able to use information technology-based learning resources and learning media (Suhendri, et al., 2020: 292). The

Director General of PAUD and Elementary Education of the Ministry of Education and Culture, namely Jumeri, revealed that 60 percent of teachers in the country have not mastered Information and Communication Technology (ICT) (published on merdeka.com., 2021).

So it is necessary to develop and improve ICT literacy for teachers so that learning in schools can take place well and learning outcomes can be optimal. teachers must improve themselves in the mastery of information technology. Using technology in learning, teachers need support, especially from their school institutions (Suhendri, et al., 2020: 292). In the same vein, Astini (2019: 114) stated that the challenges and opportunities of the 4.0 era must be used by educational units to start adjusting to various changes, so that they are ready to serve students from the millennial generation in terms of pedagogy, digital skills, basic literacy, technological literacy. , human literacy, strengthening character education and life skills.

The role or benefits of ICT literacy are very important for teachers in carrying out their duties as educators and supporting learning. In this study, the role or benefits of ICT literacy for teachers will be examined and the factors that influence ICT literacy will be identified. The study was outlined in a study entitled Technology, Information and Communication (ICT) Literacy in Mathematics Learning in the Digital Age.

Method

This study used a descriptive survey research method with the aim of describing the role of ICT literacy in learning mathematics and identifying the factors that influence ICT literacy. According to Nassaji (2015: 129), the goal of descriptive research is to describe a phenomenon and its characteristics. This research is more concerned with what rather than how or why something has happened. The research subjects were mathematics teachers at private vocational schools in South Jakarta, consisting of 5 private vocational teachers accredited A, 3 private vocational teachers accredited B, and 1 private vocational teacher accredited C.

Data collection techniques were carried out through group discussions systematically. The research instrument was in the form of a list of 4 questions, namely: (1) In your opinion, is Information and Communication Technology Literacy (ICT) important? (2) In your opinion, why is Information and Communication Technology Literacy (ICT) important? (3) According to Mr/Mrs Teachers, what are the obstacles experienced when studying Information and Communication Technology Literacy (ICT)? and (4) According to Mr/Mrs Teachers, what factors can influence Information and Communication Technology Literacy (ICT)?

Results and Discussion

The research was conducted through focus group discussions with math teachers at private vocational schools in South Jakarta. The researcher gave 4 questions to all mathematics teachers who were respondents. The results of group discussion activities are as follows.

Table 1. Result Focus Group Discussion

No.	Question	Answer
1	In your opinion, is Information and Communication Technology (ICT) Literacy important?	As many as 5 teachers (55.6%) answered it was very important and 4 teachers (44.4%) answered it was important.
2	In your opinion, why is Information and Communication Technology Literacy (ICT) important?	- Very close to the times or current conditions based on the industrial revolution 4.0 or digitally based. - ICT literacy is closely related to mathematics. - Assist in the preparation of learning implementation plans.

		- Assist in the learning process so that learning is not monotonous and able to increase student activity. - As learning media and reference sources in compiling teaching materials or materials. - Assist in the assessment process such as making questions, inputting and processing grades.
3	According to Mr/ Mrs Teacher, what are the constraints experienced when studying Information and Communication Technology Literacy (ICT)?	- Constrained by internet network and quota. - Low teacher motivation to learn ICT literacy. - Inability to manage time for work and develop ICT literacy competencies. - Lack of understanding and mastery of ICT. - No one guides or trains about ICT.
4	According to Mr/ Mrs Teacher, what factors can influence Information and Communication Technology Literacy (ICT)?	- 7 teachers mentioned training effectiveness. - 6 teachers mentioned visionary leadership. - 5 teachers mentioned work life balance. - 5 teachers mentioned achievement motivation. - 4 teachers mentioned initial abilities. - 4 teachers mentioned facilities and infrastructure. - 3 teachers mentioned organizational culture. - 1 teacher mentioned work ethic. - 1 teacher mentioned policy. - 1 teacher mentioned independence. - 1 teacher mentioned self-confidence. - 1 teacher mentioned teacher attitude.

Based on the results of the data above, ICT literacy is very important and needed by teachers in carrying out their duties. This is in line with the opinion of Suhendri, et al. (2020:292) that education in the 21st century or era 4.0 is based on information technology, so that it requires teachers to have good information technology skills. In addition, it is supported by the opinion of Helaludin (2019:53) that in welcoming the 21st century, the presence of information and communication technology (ICT) in the field of education is indeed inevitable. Almost all elements of education and learning are carried out by applying ICT in them. Teachers must be able to master ICT literacy well so that educational activities in schools, especially in the learning process, run optimally and achieve optimal results.

The role of ICT literacy in the world of education, especially learning mathematics is very important. ICT literacy supports continuity or success in classroom learning. According to Suhendi, et al. (2017: 2) that technological developments will affect the continuity of the learning process in schools, it seems that the use of technology is a primary need in the world of education, both students and teachers in general can use technology according to their development. ICT literacy can be used in learning mathematics as an interesting and interactive learning medium. Jayantika and Namur (2022:289) state that technology-based learning media can improve student learning outcomes. Changes in learning systems that are more directed at digital literacy that uses technology applications, which can further improve learning outcomes (Rediansyah in Jayantika and Namur, 2022: 286).

ICT literacy can be used as a learning resource in learning mathematics. Information technology related as a source of learning (learning resources) in the form of the internet with all its components. The internet can be considered as a huge source of information. Whatever field of interest, there must be information on the internet. Examples of information sources available online include: Libraries, Online Journals, Online Courses (Riwayadi, in Supianti, 2018: 67). This is in line with what Supianti (2018: 70) said that information and communication technology functions to produce quality and communicative information. So there is a need for renewal in learning in accordance with the digital era. Kuncahayono, et al.

(2020: 156) states that updates in the current learning model are needed so that students can play an active role in the learning process. The e-test or electronic test is part of online-based learning in which this system will help students to learn and work on online practice questions so as to produce the expected grades. ICT literacy can also be used to measure mathematics learning outcomes, such as the use of online test applications in the evaluation.

The application of ICT literacy in learning is very diverse, starting from planning, namely compiling learning administration, developing teaching materials, developing learning media. Then in the learning process using ICT in teaching and learning activities in class so that there is a two-way interaction. In learning evaluation, you can also use ICT to measure students' mathematics learning outcomes. This is supported by the opinion of Junindra, et al. (2021: 6261) that the ICT (Information and Communication Technology) based IPS and Civics learning designs in elementary schools need to be developed by teachers in the learning process such as the use of digital media in developing media, developing learning resources and developing evaluations so as to provide meaningful and fun learning for each student. Therefore, ICT literacy needs to be developed or improved, especially by teachers so that they are able to support success in learning.

ICT literacy can be developed by paying attention to the factors that can influence it. Based on the results of the study, there are 12 factors that influence ICT literacy, but the dominant ones are 7 factors, namely: training effectiveness, visionary leadership, work-life balance, achievement motivation, initial skills, facilities and infrastructure, and organizational culture. Lestari (2015: 133) states that several requirements that must be met in implementing ICT-based learning are: (1) the availability of a source of electric power; (2) access to ICT facilities, both by teachers and students; (3) the availability of quality, meaningful, and cultural support for students and teachers; (4) knowledge and skills of ICT teachers and students; (5) budget or funding support; (6) the will and commitment of various parties (both official agencies, school principals, teachers, students, and the parent community). Lestari's opinion explains the factors that can influence ICT literacy so that it can be applied in learning, namely: facilities and infrastructure (power sources, ICT facilities), initial abilities (ICT knowledge and skills of teachers and students), organizational culture (commitment school community members support ICT literacy), and achievement motivation (the willingness of school community members to learn ICT).

In line with the opinion of Silalahi (2015: 12) that the factors causing the low use of ICT include: (1) School facilities and infrastructure which are the object of research that support the implementation of learning using Information and Communication Technology (ICT) such as computers, laptops, projectors, TV and internet network are still lacking; (2) Lack of knowledge and skills possessed by teachers about ICT; (3) The unavailability of learning materials that integrate ICT. Still according to Silalahi (2015: 13) that based on the results of the pre-test and post-test assessments obtained from the results of the training participants' tests showed that there was a relationship between before and after the training was held and based on the assessment of the training participants who attended the training showed that the skill values obtained by the training participants is above the learning completeness score that has been set for the training objectives. According to Silalahi, the factors that influence ICT literacy are: facilities and infrastructure, initial skills, and training effectiveness.

Conclusion

Based on the results of the research and discussion, it can be concluded that: (1) the role of ICT literacy in learning mathematics includes: assisting in preparing lesson plans, reference sources in making teaching materials, as interactive learning media, assisting the

learning process so that students become more active. (2) Factors that influence ICT literacy consist of: visionary leadership, training effectiveness, work-life balance, achievement motivation, facilities and infrastructure, and initial abilities.

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