Integration Of Digital Technology In Mathematics Learning

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Abstract

This study aims to describe the role of digital technology integration in learning mathematics. The integration study is viewed from the perspective of mathematics learning. It was concluded that the basic principle in integrating digital technology in mathematics learning is that the use of technology does not result in poor conceptual understanding or replaces the role of students' intuition in mathematics, but technology aims to improve students' conceptual understanding and develop students' intuitive abilities in mathematics. Mathematics is divided into two categories, namely knowing mathematics and doing mathematics. Knowing mathematics is related to knowledge of mathematics as a form of knowledge. Meanwhile, doing mathematics is related to mathematical activities.

Keywords: Integration, Digital Technology, Mathematics Learning.

INTRODUCTION

At this time the world is in an era of progress that is connected by technology and digital-based communication and information devices, namely the digital era. The digital era is a situation where the use of digital (internet)-based communication and information devices is increasingly dominating various daily activities. The human tendency towards information and communication technology (ICT) in this information age is directly related to the increase in the level of computer literacy, information literacy, and also the level of community welfare.

According to Jose Mendoza & Isaac Mendoza (2018), ICT is one of the media that can be used in learning. Digital learning is an alternative in the world of education that can provide services and learning resources that are easily and quickly accessed. In the current information era, science and technology are growing rapidly.

The reality is that in human life in this digital era, it will always be related to technology. Technology is essentially a process to get added value from the resulting product to be useful. According to Putrawangsa & Hasanah (2018), the use of technology in learning mathematics can increase the effectiveness of learning. Meanwhile, according to Ekawati (2018) learning is not solely based on technology, because learning is essentially more on the process of interaction between teachers, students, and learning resources. Moreover, most students consider mathematics to be a difficult subject compared to other subjects (Isnaini Utami, Holisin, & Mursyidah, 2018).

Therefore, many opportunities can be taken for the mathematics learning process in this digital era. ICT can be used to search for learning materials, it can increase students' interest and motivation in learning (Jose Mendoza & Isaac Mendoza, 2018). Many conveniences can be obtained through the use of ICT, including being able to communicate very quickly, finding

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teaching materials very easily via the internet, and by using e-mail can send electronic mail. According to Sulistyaningsih, Purnomo, & Aziz (2019), The subject matter on the internet can increase students' knowledge in increasing their knowledge.

Hoyles & Lagrange (2010) assert that digital technology is the thing that most influences the education system in the world today. This is due to the aspects of effectiveness, efficiency, and attractiveness offered by digital technology-based learning.

With the rapid development of modern science and technology, the Information Age creates a higher demand for students' comprehensive innovation capabilities and brings difficult and urgent tasks to education. According to Xiaonan (2017) mathematics learning in universities is a basic course in the fields of science and technology, finance, history, and philosophy that can be developed by using technology.

Integrating technology is considered as one of the main challenges of the 21st century (Nurjanah, et al 2020; Dinc, 2019; Scherer & Siddiq, 2015). Teachers need to understand that the application of technology will effectively assist in teaching and expected learning outcomes (Cheok et al., 2016; Prestridge & De Aldama, 2016). Technology can support motivation, autonomy, commitment, communication, and collaboration as an effort to build meaningful active learning (Heflin et al., 2017; Mioduser et al., 2008) The use of technology in learning has several benefits including making learning more interesting, can increase student motivation and equip students to be literate in using technology. Thus, technology-based learning is very important and needs to be done. (Calderón et al., 2020; Lee, YJ, 2019). Digital technology is an important element in 21st-century education (Nurjanah, et al, 2020; Henderson et al., 2017). In the 21st century, digital technology has gained an important position and is expected to optimize student learning in schools. Many studies on the integration of digital technology in learning have been carried out by (Balakrishnan, 2014; Cutajar, 2019; Lackovic et al., 2017; YJ Lee, 2019; Ng'Ambi, 2013) suggesting the importance of using technology in learning. However, the use of technology in learning must pay attention to technological pedagogy that is based on authentic student-centered learning (Casey et al., 2017). The use and integration of technology are one of the main challenges of the 21st century (Scherer & Siddiq, 2015) that can provide implications for expected learning outcomes (Cheok et al., 2016; Heflin et al., 2017; Prestridge & De Aldama, 2016), In addition, technology can support independence, commitment, communication and collaboration as an effort to build the effectiveness of active learning and meaningful (Mioduser et al., 2008).

Based on this explanation and various research results that have been carried out by previous researchers, it is important to integrate technology in mathematics learning, so that learning becomes more creative and meaningful.

RESEARCH METHODS

This research method is a literature study research or commonly referred to as a literature study (library research). Literature study research according to Mestika Zed (2014) has the main characteristic, namely that researchers deal directly with available sources. In this article, sources are taken in the form of articles from journals that have been accredited by Sinta and journals that have been indexed by Scopus. The sources used by researchers are "ready to use" which means that researchers do not research in the field, only deal directly with available source materials (Mestika Zed, 2014). The analysis technique used in this research is the content analysis technique.

RESULTS AND DISCUSSION

Learning is a process of interaction between students, teachers, and learning resources in a learning environment that exchanges information. In the context of education, teachers teach so that students can learn and master the content of the lesson until it reaches a predetermined aspect (cognitive aspect), can also influence changes in attitudes (affective aspect), and students' skills (psychomotor aspect), but this teaching process gives the impression only as of the work of one party, namely the work of the teacher. While learning needs interaction between teachers and students.

Learning is a process of changing individual behavior that is relatively permanent as a result of experience, while learning is an effort to organize an environment that gives a nuance so that the learning program grows and develops optimally. The learning process itself is influenced by various factors, which can be grouped into self factors (internal) and external factors (external) Supardi (2015). Thus the learning process is internal and unique in individual students such as talent and intelligence, creativity, motivation, interest, and attention while the learning process is external which is intentionally planned, and behavioral engineerings such as the social environment, physical environment, and learning facilities.

Learning in schools is to understand well the material to be taught, to understand and make good use of how students learn effectively, to use learning methods, and to understand and apply how to use media as learning aids. Where according to Rangkuti (2014) the creativity of learning mathematics in Indonesia needs to be continuously developed, therefore mathematics must be taught interestingly and connected to the real world so that students are happy. There are so many methods and learning strategies that have been implemented in Indonesia, but are not yet optimal in their implementation, so teachers are still confused about applying good learning methods for their students.

The success of learning is not only manifested in the results of student achievement in school, but successful learning is learning that can develop what has been learned in school and apply it in everyday life. The In the success of learning requires the role of professional teachers in all fields. Teachers not only understand methods, strategies, and class control but must be able to master technology, especially in the field of information and communication. Information and communication technology is a tool that will make what we do easier.

According to Tatan ZM & Sumiati (2011), the development of the latest information and communication technology is increasingly spreading and attacking like a tsunami wave in society and causing extraordinary changes in learning interactions. This wave forces teachers to think about changing strategies in the selection of learning media and students are required to adjust their teaching styles, it can even happen, on the contrary, teachers are required to adjust students' learning styles. As a teacher, you must be able to use this technology in learning, especially mathematics which is considered difficult by students, so that it can make students feel happy with mathematics. This is following the opinion of Jose Mendoza & Isaac Mendoza (2018) that technology is an innovation that can help students understand the material and increase students' knowledge in the learning process. Radhy (2019) Meanwhile stated that in preparing the teaching and learning process teachers can utilize technology so that learning becomes effective and efficient.

Mathematics is a basic science that plays an important role in everyday life and is one of the fields of science that has a very large influence on the development of science and technology (Habibullah & Bulan, 2017). This is also the opinion of Maulana Yusup (2017). Mathematics education is part of national education which plays an important role in the development of science and technology and every aspect of life. And Mathematics is not only arithmetic but also a science that requires the ability to think and reason logically and critically.

To facilitate this, information and communication technology is an alternative that can be used by teachers in the mathematics learning process to support more collaborative communication so that it can develop all the creativity possessed by students (Habibullah & Bulan, 2017). In the process of applying mathematical knowledge, students can structuralize their existing schema of mathematical concepts to incorporate new conceptual information and increase their creativity (Lee, Capraro, & Capraro, 2018).

The use of information and communication technology cannot be separated from a problem as stated by Harrison & Lee (2018). One of the obstacles of using technologies like these to reshape the mathematics classroom is teachers being ill-equipped to determine how best to use these devices. Teachers are one of the main factors in learning obstacles in this digital era because teachers are mentors who will direct their students to be wider to get information. When teachers are unable to keep pace with their students in the use of technology, it can make mathematics learning monotonous. According to Anshori (2016), Learning Strategy in digital form is a technique used to make students more comfortable in learning. If a material is displayed that attracts students, it will affect the views of students in receiving lessons so that it will affect learning outcomes.

According to Gallardo-echenique, Bullen, & Molias (2016), the digital era is a term associated with digital technology such as computers, software, multimedia, and devices that can process and present information quickly. Smite (2013) argues that currently many people around the world are using the internet and doing their daily activities online. Meanwhile, according to Ghotbifar, Marjani, & Ramzani (2017), there have been extensive developments in communication and marketing in the digital era.

With the development of technology, it is easier for children to find all information. Where the study in mathematics is non-physical, namely examining the structure of abstract ideas. Thus, when someone is studying mathematics, he is studying mathematical ideas where these ideas are collected in a collection of concepts and principles that are interrelated with one another. This relationship then forms a system known as mathematics. The abstraction of the object of this mathematical study is suspected to be the cause of the difficulty of students understanding it. In this case, digital technology is seen as an effective alternative media to help students discover and develop their conception of abstract mathematics.

According to Wartomo (2016), there are seven roles of teachers in digital era learning, namely: teachers as learning resources, teachers as facilitators, teachers as managers, teachers as demonstrators, teachers as mentors, teachers as motivators, and teachers as elevators.

- Teachers as learning resources; the teacher's role as a learning resource is related to the teacher's ability to master the subject matter. So that when students ask questions, swiftly and quickly, the teacher will be able to immediately answer them in language that is easily understood by their students.
- Teachers as facilitators; the teacher's role in providing services to students to make it easier for students to receive subject matter. So that learning becomes effective and efficient.
- Teachers as managers; In the learning process, the teacher's role is to have full control over the climate in the learning atmosphere. It is like a captain who holds the steering wheel of a ship, which leads the ship safely and comfortably. Teachers must create a comfortable and conducive classroom atmosphere. So that students can receive learning comfortably.
- The teacher as a demonstrator; acting as a demonstrator here is not meant to take to the streets to demonstrate. But what is meant here is the teacher as a figure whose role is to show attitudes that will inspire students to do the same thing, even better.

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- Teachers as mentors; In his role as a mentor, the teacher is asked to be able to direct students to become what they want. But of course, the teacher must guide and direct to be able to achieve the ideals and dreams of these students.
- Teachers as motivators; The learning process will be successful if students have motivation within themselves. Therefore, teachers also play an important role in fostering motivation and enthusiasm in students to learn.
- The teacher is an elevator; After carrying out the learning process, the teacher must evaluate all the results that have been done.

Goos (2010) divides mathematics into two categories, namely knowing mathematics and doing mathematics. Knowing mathematics is related to knowledge of mathematics as a form of knowledge. Meanwhile, doing mathematics is related to mathematical activities. Olive & Makar (2010) also emphasized that if mathematics is seen as a fixed collection of knowledge (knowing mathematics), then in this case technology can act as an efficient tool to speed up solving mathematical problems, such as calculation problems, and so on. Meanwhile, if mathematics is seen as a mathematical activity (doing mathematics), then technology in this case will act as a learning tool to help students find mathematical concepts and the relationships in them to develop students' conceptual understanding of mathematics.

According to Birdsall (2009), one challenge is meeting the needs of diverse academic disciplines that are also going through their transformations to the dynamic digital environment. And according to Jotikabukkana, Sornlertlamvanich, & Manabu (2016) Social media is a powerful communication tool in our era of digital information. Divergent thinking refers to the propensity for the mind to generate ideas and solutions to problems outside of normally prescribed expectations according to Byrne et al (2018).

CONCLUSION

Based on the description above, it can be concluded that the basic principle in using digital technology in mathematics education is that technology is not used as a substitute for the use of conceptual understanding and mathematical intuition, but on the contrary, technology plays a role in increasing students' conceptual understanding of mathematical ideas and also developing students' intuition skills in mathematics.
Mathematics education is part of national education which plays an important role in the development of ICT and every aspect of life. And Mathematics is not only arithmetic but also a science that requires the ability to think and reason logically and critically. Learning strategy in digital form is a technique in making students more comfortable in learning if an interesting material is displayed for students so that positive thoughts emerge for students that can affect student learning outcomes

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