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The Effect of Using STEM Learning Models for Students to Improve Digital Literacy Skills in Elementary Schools

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ABSTRACT

This study aims to analyze the influence of the use of STEM learning models for students to improve digital literacy skills in elementary schools. The method used in this study is quantitative research with a correlational design. The subject of the study was one hundred and ten respondents consisting of two schools, namely public elementary school (SD Negeri 2 Grenggeng and SD Negeri 1 Tanggeran). The research instrument uses questionnaires and the data are tested using validity tests and reliability tests. With the use of STEM learning models in the application of digital literacy, the results are homogeneous and correlated. The results showed that the use of STEM learning models can improve students' digital literacy skills. The use of STEM learning models can be implemented in science, mathematics, and language subjects.

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1. Introduction

In the era of the fourth revolution known as the digital revolution, all information can be obtained in real-time and quickly anywhere and anytime. Friedman (Afandi, Junanto, & Afriani, 2016) illustrates this change as "the world is flat" which refers to a state where the world is not limited to country boundaries and time zones due to technological developments. The development of information technology has created a "new space" that is artificial and virtual, called cyberspace (Piliang, 2012). The development of information technology is responded to by the penetration and behavior of the use of digital media which has experienced growth from year to year. The development of information technology is part of the emergence of the digital revolution era. Its very rapid development is able to exert a great influence and dominate all sectors of people's lives, including in the world of education. Academic demands at each level of education in Indonesia are different (Akbar & Dina, 2017). Digital education is a concept / way to provide lessons to students using multimedia media, including using the help of computers / notebooks, smartphones, videos, audio and visuals. According to Kristiawan et al (2019) in the world of education, it does not only focus on one technology used, but technology is very diverse and will be used according to the needs of learning. With the development of learning designs (learning designs), in addition to using software (software) also involves the use of digital media.

The outbreak of the Covid-19 pandemic in the country has hit various public sectors which have an impact with various problems and crises. The Education sector is no exception to the economy. The government through the Ministry of Education and Culture (Kemendikbud) finally implemented the Learning from Home policy (Chabibie, 2020). Where the last two years not only the Indonesian nation but the whole world is being hit by a disaster, namely the outbreak of the Covid-19 virus or known as the corona virus. The Corona Virus suddenly took the world by storm, making all mankind on this earth shocked. The life of the world seems to be going slowly, which requires us mankind to adjust to a new pattern of life. Inevitably, we will still enter a different world order and system, during the pandemic and post Covid-19. Likewise, the world of education must adjust to the new flow due to the impact of Covid-19. We must prepare ourselves to enter the new world of education after Covid-19. Educators or teachers, parents of

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students, students, and higher education institutions must change to adapt to the new flow, which is more adaptive to the current era

In order to reduce the spread of the Covid-19 virus in advance of the earth, the government has made a policy, namely physical distanting, which includes a special policy for students starting from kindergarten, elementary school, junior high school, high school to pt learning from home. Educators/teachers, lecturers, students, students and parents, interact through technology. E-learning-based education is a new strategy in the teaching and learning process. People from all walks of life are forced to move quickly, adjust to the challenges of the times, maximize technology and creativity. Therefore, the government made one change in the world of education, namely with the concept of independent learning. With the concept of independent learning, students can learn at home by bringing the subject matter provided by a teacher in the form of e-learning in the form of an interactive CD. So, digital-based education has now begun to be widely used by education practitioners such as teachers and lecturers. E-learning is an example of a digital-based education product. With the use of e-learning in learning, learning is no longer in the classroom, but outside the classroom (Rusman et al).

The change in learning habits from face-to-face to online is challenging. The challenge of ensuring students continue to study during the pandemic is not easy. One alternative to ensuring students keep learning is to digitize learning. Digitalization of learning can be in the form of the availability of learning devices, classrooms, libraries, conference calls, and so on by utilizing technology that can be accessed anywhere, anytime and with anyone.

Digitalization of learning during a pandemic involves the roles of various parties. Not only teachers, students, and governments, but information and communication technology service providers and telecommunications networks. Collaboration between all parties supports each other's acceleration in the digitization of learning. The hope is that digitalization of learning will not only keep students learning, but create learning patterns that prepare students for life in the future.

Digitalization of learning is an alternative to ensure students continue to learn. Although there are many challenges and obstacles, in fact, obstacles can be passed with the cooperation of all parties. Digitalization of learning makes the learning process effective and efficient as long as facilities are available. However, even limited facilities do not mean that digitalization of learning cannot be implemented. Digitalization of learning not only ensures students keep learning, but various benefits can be obtained by students.

However, in the second year of the Covid-19 pandemic, digitalization in the digital-based learning process is familiar. Various learning activities have been digital-based, virtual classes based on the Learning Management System from online meetings, online exams, digital books, digital absences have become commonplace in the majority of schools in developing areas. In fact, social media has become a widely used classroom.

According to Paul Gilster in his book entitled Digital Literacy (Kemdikbud, 2017) digital literacy is defined as the ability to understand and use information in various forms from a very wide range of sources accessed through computer devices. The results of research reported by Mitchell Kapoor (Kemdikbud, 2017) show that the younger generation who have the expertise to access digital media, currently have not balanced their ability to use digital media for the benefit of obtaining self-development information.

STEM is a learning approach. Where STEM is a term used to refer collectively to teaching and approaches across disciplines, science, technology, engineering, and mathematics. By applying STEM in learning, it can be a place to create the next generation of the nation in the era of globalization. STEM implemented in the classroom is expected to make students have systematic skills and good concepts. With STEM, students can have the knowledge, attitudes, and ability to identify problems in life situations, explain natural phenomena, design, have critical thinking skills that can be seen from reading, writing, observing, and seen from scientific attitudes. So that it can be used as a provision for social life and solving problems faced in daily life related to the field of science.

Beers (2011) stated that the STEM curriculum involves the "4C" of 21st century skills, which include creativity, critical thinking, collaboration, and communication. Another goal of the STEM approach is 1). so that students have science and technology literacy such as reading, writing, observing and doing science. So that when students are in society, they are able to develop the competencies they already have to be applied in facing problems in life related to science. 2). so that students can have science and technology literacy as seen from reading, writing, observing and doing science so that if students later enter the community, students will be able to develop the competencies they already have to be applied in facing problems in daily life related to the field of STEM science. With STEM education, learners can develop cognitive abilities, these cognitive abilities are 21st century abilities including adaptability, complex communication, nonroutine problem solving, self-management and thinking systems.

Research on e-learning has also been conducted by Chandrawati on the use of e-learning in learning. The results showed that the development of e-learning has three possibilities in an internet-based learning

system, namely web courses, web centric courses, and web enhanced courses (Chandrawati, 2010). In addition, Afandi, Junianto, and Afriani wrote a scientific article on literacy in the digital age (Afandi et al., 2016). The conclusion in the article explains that referring to the document published by EnGauge 21st Century Skill, there are 4 main domains, one of which is the Digital-Age Literacy domain which consists of eight aspects, namely basic, scientific, informational, visual, technological, and multicultural literacy as well as global awareness. Other research conducted by Wijaya, Sudjimat, and Nyoto (2016)

The implementation of digital literacy can be carried out by schools by constantly updating their curriculum with digital literacy, to keep up with the acceleration of technological developments. As well as facilitating computers in the classroom, the use of educational software to teach the curriculum, and course materials made available to students online. Furthermore, digital literacy must also be able to provide a comprehensive understanding of the use of digital devices only for positive things. All elements involved in the realm of education must be able to implement it through programs that support the availability of digitally literate students. But in line with that, it must also be accompanied by a strong foundation so that the competencies they have do not lead to negative sides. To achieve this, support from various related parties is needed. In addition to the school, support must of course also be provided by parents of students and the community as part of the tri-center of education. Digital literacy is one of the competencies that must be possessed by every student. The implementation of this policy must be encouraged in response to the entry of life in the era of the industrial revolution 4.0 (computer / internet of things). As one of the domains of life that must prepare the next generation for the future, education must be at the forefront of implementing digital literacy. The realm of education must respond proactively to the phenomena that occur, including responding to changes in this era of life.

The purpose of implementing digital literacy is to educate school residents, especially students in utilizing digital devices and communication tools or networks to find, evaluate, use, manage, and create information wisely and creatively. In addition, digital literacy also aims to enable every user to use digital media wisely, creatively, and responsibly, knowing the aspects and consequences of applicable law. In line with that, the realm of education by positioning schools as the spearhead must respond through the application of appropriate policy strategies, so that the steps taken do not eliminate the phenomenon of life development that occurs at this time and in the future. As one of the domains that must prepare future generations, education policy must be responsive to these changes.

One of the responses that must be carried out by the school is to provide the widest possible space and opportunity for all students to develop their potential through literacy activities. In the context of the Industrial Revolution 4.0, the literacy that must be encouraged is one of the six literacy competencies that students must have, namely digital literacy. The step that every school policymaker must implement is to strictly control students so that they can utilize digital devices wisely, creatively, and responsibly. Control cannot be done by the school alone, but must have the support of every parent of the student and the community. Through this step, students can be directed to only use digital devices for the learning process, information retrieval, and other positive things.

In order to achieve the birth of digital literate students while still positioning their abilities for the implementation of learning, there are five strategies that schools can do. First, strengthening the capacity of educators and education staff so that they understand the phenomenon of digital literacy and can be an example for every student. Second, increasing the number and variety of learning resources to provide opportunities for students to choose digital information sources. Third, expanding access to learning resources that can be utilized to make it easier for all students to access various information from the internet. Fourth, increasing the involvement of the public who have competence in digital literacy and elements of the tri-center of education to provide input and assistance related to the wise, creative, and responsible use of digital devices. Fifth, strengthening school governance through the development of an electronic administrative system, so that students and all school residents can access it easily, without being constrained by time and space. Through the five strategies implemented by the school, it is possible that students will have digital literacy competencies. Ownership of these competencies is certainly expected to be accompanied by the appointment of a wise, creative, and responsible attitude from all students. In this context, schools, parents, and the public should not get bored reminding students that their digital literacy competencies are like a double-edged knife. Wrong in the use of their competence, can be fatal for students.

The purpose of this study is to determine the influence of the use of STEM learning models for students to improve digital literacy skills in elementary schools.

In recent years, the world has been shocked by the coronavirus (covid-19) outbreak. Where all community activities are constrained, including education. Education in Indonesia after the covid-19 was transferred, which was previously carried out face-to-face (offline) schools were changed to face-to-face (online). With this transfer, the curriculum used also changed. Where the curriculum used is the independent learning curriculum. The independent learning curriculum is an idea launched by the minister of education

and culture, to produce superior human resources by prioritizing character education. The goal is to create critical, creative, collaborative and skilled learners. One of the concepts of independent learning, of course, must be accompanied by the freedom of teaching for teachers.

The COVID-19 pandemic threatens education, where learning is not effectively implemented. During the pandemic, learning was carried out online as one of the measures to prevent COVID-19. Therefore, researchers will examine digital literacy. The researcher chose this, because most of the learning activities of students are at home. With a long duration of online learning, there are many obstacles faced by students, one of which is literacy. There are various kinds of literacy, there are media literacy, basic literacy, digital literacy, library literacy, visual literacy. However, researchers focus more on digital literacy. Where digital literacy is related to online learning experienced by students. During the pandemic, students are faced with digital-based learning media to support teaching and learning activities. Proficiency in using digital media during learning can be seen from the understanding or not of students when using these media. For example, the use of WhatsApp, Google Classroom, Google Form appropriately. So that researchers examine the level of digital literacy in students in elementary schools with the aim of knowing students' understanding of digitalization in learning.

This research does not necessarily consist of itself above personal thinking, but rather the existence of previous studies that have relevance / relationships as reference material for researchers in carrying out this research. The relevant research includes the following: 1) This research was conducted by Rila Setyaningsih et al from Darussalam Gontor University and Gunadarma University with the title "model of strengthening digital literacy through the use of e-learning". This research used a digital literacy strengthening model at Darussalam Gontor University. This research uses qualitative descriptive method. This research focuses on strengthening digital literacy using the implementation of communication and collaboration elements consisting of three components of individual competence, namely use skills, cririca l understanding, and communicative abilities in learning activities carried out by utilizing e-learning. 2) This research was conducted by Yulisnawati

Tuna from the Postgraduate Basic Education University of Gorontalo State with the title "digital literacy in learning in elementary schools as an effort to improve the quality of educators". This research used descriptive qualitative. This research focuses on digital literacy in elementary schools through in-class and out-of-class learning based on technology. 3). This research was conducted by Ratika Sekar Ajeng Ananingtyas et al from Nahdatul Ulama Blitar University with the title "Development of Arduino-based learning media on STEM learning in improving scientific and digital literacy". This study used media/props. This research focuses on the feasibility test of the use of Arduino-based learning media and the development of STEM learning to improve science and digital literacy as evidenced from the data of the feasibility test results with an average score of 3,862 which means it is very good. 4). This research was conducted by Muhamamad Aqmal Nurcahyo and Dessy Setyowati from the Elementary School Teacher Education of Nahdatul Ulama University, West Kalimantan. Inai research uses development research. This research focuses on innovations in virtual learning that are carried out using digital learning modules through the application of mobile learning. 5). This research was conducted by Firti Handayai from the University of Muhammadiyah Surakarta with the title "building students' critical thinking skills through STEM-based digital literacy during the Covid-19 pandemic. This research uses qualitative in the nature of a literature study. This research focuses on improving the content of new STEM-based sciences during the pandemic so that teachers can explore the skills of students with STEM-based digital literacy so that they are able to be skilled in solving problems in their lives.

Based on the explanation above, it can be concluded that digitalization in education can make students able to have skills to use technology in education. From several previous studies, there are many learning models used to improve digital literacy. Each research conducted is a different learning model. In this study, researchers used STEM learning models to improve students' digital literacy. Where STEM is a teaching and approach across disciplines, science, technology, engineering, and mathematics. have the knowledge, attitudes, and ability to identify problems in life situations, explain natural phenomena, design, have critical thinking skills that can be seen from reading, writing, observing, and seen from scientific attitudes.

2. Method

This research uses quantitative research. According to Creswell (2012: 13), quantitative research requires researchers to explain how variables affect other variables. Then according to Sutama (2016: 43) quantitative research is closely related to social survey techniques including structured interviews and compiled questionnaires, experiments, structured observations, content analysis, formal statistical analysis and much more. Quantitative research emphasizes objective phenomena and is studied quantitatively. The

maximization of the objectivity of the design of this study was carried out using statistical processing figures, structures and controlled experiments. \ The purpose of this quantitative research is to develop mathematical models, theories and or hypotheses about a phenomenon, as well as the relationship of variables in a population. In this quantitative research, researchers use survey methods and correlational methods. Then for the research design used, namely by using statistical processing.

The research design used in this study is to use a correlational design, namely the relationship between the free variables X and Y. There are free variables (independent) namely the STEM learning model (X) and bound variables, namely digital literacy ability (Y).

Data and Data Sources

This study took samples from two elementary schools in the Kebumen region, Central Java. The population taken was students at SD Negeri 2 Grenggeng and SD Negeri 1 Tanggeran

The data in this study consisted of a questionnaire transkip on digital literacy in elementary schools. In this study, the participants were students. Researchers sampled 110 respondents. This is done to facilitate data processing and better test results.

For the sampling technique, the author used a simple random sampling technique. In this study, pourposive sampling was used to assess the influence of using STEM learning models. As for simple random sampling, it is used to assess digital literacy skills in elementary schools.

Data collection technique

The data collection technique used in this study was by distributing questionnaires in two elementary schools. The goal is to be able to find out the success of students in using STEM models and their ability to use digital literacy.

The instrument used in this study was in the form of a questionnaire using the Likert scale. To measure the variables above, a four-level likert scale is used. This method is used so that researchers can find out and have data on the assessment given by each student so that conclusions can be drawn.

Data Validity

In this study, the use of research instruments is to determine the use of STEM learning models (free variables) for students to improve digital literacy (bound variables) in elementary schools. The instruments used in this study are intended to produce accurate data, namely by using the Likert scale.

This study used Theoritical Literature Review. A review of the theoretical literature focuses on a collection of theories that have accumulated with respect to problems, concepts, theories, phenomena. The review of the theoretical literature plays an important role in establishing what theories already exist, the relationships between them, to what extent the existing theories have been investigated, and in developing new hypotheses to be tested (Lai, 2011; APUWriting Center, 2015).

In this study, the data that has been obtained was tested to obtain the validity of the data using the IBM Stasistic 25 application. The research instruments that researchers use have passed the validity test and reliability test. Validity test is a degree of determination of the instrument (measuring instrument), meaning whether the instrument used is really appropriate to measure what will be measured (Arifin, 2012: 245). While reliability is the degree of consistency of the instrument in question. Realibility with regard to statements, whether an instrument can be trusted according to predetermined criteria (2012: 248)

In this validity test, it is able to correlate between each indicator item score with the total construct score. The level of significance used is 0.05.The test criteria are:

- H0 is accepted if r calculate > r table, (the measuring instrument used is valid or valid)
- H0 is rejected if r statistics ≤ r table. (the measuring instrument used is invalid or valid) Meanwhile, in the reliability test, the requirements

Realibity according to Arifin (2012: 248) is the degree of consistency of the instrument in question. Realibility with regard to statements, whether an instrument can be trusted according to predetermined criteria. Testing the reliability of the instrument using the Alpha Cronbach formula because this research instrument is in the form of a questionnaire and a multilevel scale.

After the instrument passed the validity test and reliability test, the researcher tested the data obtained using a normality test, homogeneity test and correlation test.

Data analysis

This study uses a type of inferential statistical analysis that uses drawing conclusions and making decisions based on the analysis that has been carried out by taking samples from a large population. In inferential statistics, researchers use correlation and homogeneity analysis.

Correlational analysis is a statistical analysis that seeks to find relationships or influences between two or more variables. In this correlational analysis, variables are divided into two parts, namely free variables and bound variables. The data scale in this study uses interval / ratio data, namely quantitative data or data in the form of numbers or can be estimated. This research is about the relationship between the use of STEM (X) learning models for students to improve digital literacy skills in elementary schools (Y).

3. Result and Discussion

This research is a study conducted to determine the relationship between the use of STEM learning models and digital literacy skills in students. Researchers conducted the study in two elementary schools in Kebumen Regency, Central Java. The intended elementary schools are SD Negeri 2 Grenggeng with 67 respondents and SD Negeri 1 Tanggeran with 43 respondents. Researchers used questionnaires and disseminated them in the form of hard files. The deployment technique uses the personally administrered questionnaire technique. The instruments in this study have been tested for validity and reliability, the results are valid. Once the instrument is valid, then the researcher tests using a homogeneity test. Based on the table below, the homogeneity test results on the data are homogeneous. The data is said to be homogeneous because the significant value on the data is 0.534. So, its significant value > 0.5.

Table 1. Test of Homogeneity of Variances

		Levene Statistic	df1	df2	Sig.
Result	Based on Mean	.394	1	38	.534
	Based on Median	.328	1	38	.570
	Based on Median and with adjusted df	.328	1	37.047	.570
	Based on trimmed mean	.300	1	38	.587

After the homogeneity test, it then tests using a correlation test. Based on the table below, the results of the correlation test for the relationship of significance between STEM learning models and literacy skills. From this output, it can be known the significance value of 0.015. Since 0.015 < 0.050 , then it correlates. So, there is a relationship between STEM learning models and digital literacy skills. Then for pearson the correlation is 0.537. So for the degree of the relationship between STEM learning models and digital literacy skills, the colleration is strong. So in conclusion, the STEM learning model is positively related to digital literacy ability with a strong degree of correlation relationship.

Table 2. Correlation Test

		Model Stem	Digital Literacy
Model Stem	Pearson Correlation	1	.537*
	Sig. (2-tailed)		.015
	N	20	20
Digital Literacy	Pearson Correlation	.537*	1
	Sig. (2-tailed)	.015	
	N	20	20

*. Correlation is significant at the 0.05 level (2-tailed).

After processing the data, conclusions are reached. The conclusion of this study is that stem learning models have an effect in improving the literacy ability of students in elementary schools.

Discussion

Learning using technological devices is part of efforts to improve students' digital literacy. Digital literacy is a set of abilities that a person has in using, processing, and communicating information obtained through a variety of digital devices. Digital literacy includes all digital devices, such as computer hardware, software, the internet, and mobile phones. The implementation of learning with STEM models can improve students' digital literacy skills. With the collaboration between STEM learning models and gitial literacy, it

is an alternative in order to build a generation that is able to face the 21st century, it is relevant to support innovative learning at this time. STEM learning expects students to be prepared to face the rapidly growing era of globalization.

The results of Yulisnawati Tuna's research, 2022, said that the implementation of digital literacy can be used as an interesting learning alternative using digital sources. Digital literacy can be used as a social reference to support learning. By using digital sources, learners not only focus on understanding the material, but also the creative process in utilizing information technology. The benefits of digital literacy for students are that they can improve communication with teachers or friends using social media, are able to send assignments through online learning applications (google classroom, email, etc.), are able to search for teaching materials on the internet, are able to use laptops / cellphones. Furthermore, the results of research reported by Mitchell Kapoor (Kemdikbud, 2017) show that the younger generation who have the expertise to access digital media, currently have not balanced their ability to use digital media for the benefit of obtaining information on self-development. In addition, Afandi, Junianto, and Afriani wrote a scientific article on literacy in the digital era (Afandi et al., 2016). The conclusion in the article explains that referring to the document published by EnGauge 21st Century Skill there are 4 main domains, one of which is the Digital-Age Literacy domain which consists of eight aspects, namely basic, scientific, informational, visual, technological, and multicultural literacy as well as global awareness. In addition, Yulisnawati Tuna 2021, said that digital literacy in elementary schools is not just using the internet to find information or entertainment. Literacy should be a means to shape learners' ability to think analytically, synthesis, analysis, critically, imaginatively, and creatively. Digital literacy can be used as a social reference to support learning. By using digital sources, learners not only focus on understanding the material, but also the creative process in utilizing information technology.Furthermore, Fitri Handayani 2020, said that the purpose of digital literacy is to be able to build critical thinking skills through a STEM-based digital literacy culture, create interest and involvement of students in learning, create networks, and improve 21st century competencies. In addition, the STEM-based digital literacy that is expected for students is that students are able to learn and excel, able to improve critical thinking skills through STEM-based digital literacy, which in the end is able to be skilled in solving problems in real life.

From some of the research results above, it can be concluded that digital literacy in the current era is very important, especially in learning. Students are required to have expertise in accessing digital media. Therefore, with the STEM learning model applied to improve the ability of students, it can be implemented properly so that students are able to develop their skills and themselves and are able to solve problems that exist in real life.

4. Conclusion

Digital-based learning implemented in Indonesia aims to support teaching and learning activities during the Covid-19 period. In this study, researchers used a STEM learning model applied to digital-based learning with the aim of being able to find out the influence of using STEM learning models for students to improve digital literacy skills in elementary schools. In addition, with stem-based digital learning, students can also take advantage of digital devices and communication tools or networks to find, evaluate, use, manage, and create information wisely and creatively so that later they can express 4C (creativity, critical thinking, collaboration and communication).

STEM learning models play an important role in improving the literacy skills of students. Where in this study, the instrument was tested with validity and reliability tests. The result is valid. Then the result of the homogeneity test of the significance value is 0.534, or it can be interpreted that the data is homogeneous. Then for the correlation test, the significance value is known, which is 0.015, which means it is correlated. Then for pearson the correlation is 0.537 which means the correlation is strong. So, stem learning models affect students' digital literacy skills. With the STEM learning model in digital literacy, students can take advantage of digital devices and communication tools or networks to find, evaluate, use, manage, and create information wisely and creatively so that later they can imply 4C (creativity, critical thinking, collaboration and communication).

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