

Digital Literacy: The Need for Technology-Based Learning Media in the Revolutionary Era 4.0 for Elementary School Children

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Abstract— Digital literacy today is indispensable for students to use technology according to their needs and capacities. This study aims to analyze educational game-based learning media's needs in the era of industrial revolution 4.0 using descriptive research with an explorative qualitative approach. The research was conducted on grade V elementary school students in Surakarta City. Data collection through interviews and questionnaires. Interviews were conducted on three teachers selected with purposive sampling techniques. The questionnaire was distributed to 85 students online through JotForm. Source triangulation was chosen as a way to assess the validity of data and by using interactive analysis consisting of data collection, data reduction, data presentation, and conclusion drawing obtained research results that show that students need interactive learning multimedia in the form of educational games that can be used on smartphones and computers or laptops. Educational games are expected to be a solution to elementary school students' learning media needs in math subjects and improve students' learning motivation and understanding.

Keywords— *the era of industrial revolution 4.0; educational games; digital literacy; interactive learning multimedia*

I. INTRODUCTION

The development of technology in industrial revolution 4.0 led to systematic changes in various fields such as technology, education, culture, politics, and economics [1], [2]. One of the most significant impacts on the world of education [3]. The emergence of the industrial revolution 4.0 had a massive effect [4], resulting in changes in the education system, such as adjusting educational objectives, learning curriculum, teaching strategies, school management, administrative processes, assessment, and evaluation of learning [5]. Qualified human resources are certainly needed to catch up with the quality of education in Indonesia.

Era 4.0 is also referred to as the digital age [6], where almost all life elements cannot be separated from technology [7]. There is no denying that all human beings need technology nowadays, including students at the basic education level. One of the pieces of evidence that everyone needs technology is the smartphone needed by everyone, including students at the elementary education level. Especially during this pandemic, all educational activities are carried out online to demand students to use smartphones [8].

Smartphones are one of the digital devices that can support the implementation of learning [9]. However, smartphone learners have a significant influence on their daily lives [10]. Many of them use smartphones just to spend time in vain by playing games, social media such as Facebook, TikTok, Instagram, and others as such [11]. As a result, they lose time to learn to have an impact

on learning outcomes. Learners are the country's most significant investment [12]. As the next generation in the future, of course, it should be prepared as best as possible included in smartphones.

Efforts to print a quality generation cannot be separated from the role of a teacher. Teachers are one of the most critical elements in education. Teachers are professional educators with the main tasks of educating, teaching, guiding, directing, training, assessing, and evaluating learners from early childhood education to formal education, primary and secondary education [13]. In addition to mastering technology, teachers should also explain to students how to apply technology in daily life [14]. Therefore, educators and students must be able to keep up with the current educational developments. Education in the 4.0 era is an education characterized by digital technology in the learning process or known as a cyber system [15]. This system can make the learning process can take place continuously without space limits and time limits [16]. Through the integration of technology in freedom of learning, it is expected that effective and efficient learning will be created. Therefore, teachers who become the vanguard in the world of education are required to conduct innovative learning.

In addition to teachers, two elements are essential to achieving learning objectives, namely learning models and learning media [17]. Teachers, learning models, and learning media are integrated. Teachers as implementers of learning should choose the suitable model and learn media for their students. Teacher's selection of learning models dramatically influences the learning media to be used [18]. Learning media serves as a tool that can affect the condition of learners [19]. Therefore, learning media has an essential role in the learning process. The effectiveness and efficiency of learning can be obtained through learning media [20].

There are several learning media types, namely visual-based media, audio-based media, audio-visual and multimedia-based media [21]. Based on its classification, multimedia is one of the most complex media because it is necessary to combine several media in its application. The use of interactive media in the learning process can increase the interest and motivation of learning caused by its interest in multimedia systems that display text, images, video, audio, and animation [22]. From the statement, it can be said that students' interest in learning using interactive multimedia is due to the attractive appearance and support of the learning process. Several studies related to interactive multimedia development concluded the same thing [23]-[25]. Besides, through multimedia, students can develop their digital literacy [26]. This can happen by utilizing multimedia to encourage students to interact with technology interactively. Digital literacy is the ability to use and understand information from various formats (audio, images, video, text, and animation) and multiple sources available through digital devices [27]. Digital literacy is one of the four domains needed to live in the 21st century [28]. Today's digital literacy needs are urgently needed so that students can use technology according to their needs and capacities.

Some elementary schools in Indonesia still use conventional learning media when learning face-to-face and online learning [29]. Therefore, the development of android-based interactive multimedia (smartphone) becomes a thing that must be done immediately. Delays in interactive multimedia development are feared to make it wrong for primary school students to take advantage of smartphone use. This study aims to analyze and describe the needs of teachers and students on appropriate learning media to improve the digital literacy of students in elementary schools. This study's findings are expected to be a reference for other researchers to develop innovative interactive multimedia to be applied in elementary schools.

II. RESEARCH METHOD

This study uses a descriptive research design with an explorative qualitative approach. Descriptive research is defined as a study that aims to present a complete picture of social settings or is intended for exploration and clarification of a phenomenon or social reality [30]. An explorative qualitative approach aims to explore broadly and deeply the causes or things that affect the occurrence of something. The exploration design was chosen because it could investigate various complex patterns of individual and group experiences involved [31].

2.1. Research Subjects

The research was conducted in Surakarta, with 85 respondents from grade V and three teachers from three schools with more certified teachers than uncertified teachers. The three teachers were chosen using purposive sampling techniques, namely, in addition to being a grade V teacher from each school and a teacher who has a certificate of professional educators.

2.2. Research Instruments and Data Collection Techniques

In addition to researchers as the main instrument, this study used two auxiliary instruments in interview guidelines and

questionnaires. Two experts have validated both instruments in the field of mathematics education with doctorates from Sebelas Maret University. Interviews were conducted with grade V teachers, and questionnaires were distributed to all student respondents online through JotForm. Interviews and questionnaires will be conducted from March 25 to 27, 2021.

2.3. Data Analysis Techniques

The validity of data using source triangulation is by comparing data from interviews with teachers and questionnaires of students' needs. Furthermore, the data obtained in the analysis uses an interactive analysis put forward by Miles and Huberman consisting of data collection, data reduction, data presentation, and conclusion drawing [32].

III. RESULT AND DISCUSSION

As explained earlier, in this study, the study respondents consisted of two categories, namely teachers and students. Interviews are conducted with teachers, while questionnaires need to be distributed to students. An interview used in this study is an in-depth interview, which is the process of obtaining information for research purposes through question and answer while face-to-face between the interviewer and the respondent [33]. Questions are asked in-depth on a predetermined topic (based on the interview's purpose and intent) using an open question [34].

Interviews were conducted with V-grade teachers in each school where the three teachers have been certified. Educator certification is a benchmark for teachers to be said to be professionals. Referring to the Regulation of the Minister of National Education (PERMENDIKNAS) number 16 of 2007 concerning academic qualification standards and teacher competencies, teacher professional competency standards include (1) mastering materials, structures, concepts, and scientific mindsets that support the subjects mastered; (2) mastering the standard of competence and essential competencies of the subjects/areas of development that are mastered. (3) develop creatively capable learning materials. (4) develop professionalism sustainably by performing reflective actions. (5) utilizing information and communication technology to communicate and develop themselves [35].

The criteria of professional teachers defined in PERMENDIKNAS no 16 are contrary to the existing circumstances. Based on the results of interviews that have been conducted show that the teachers are elderly, it is challenging to meet professional teachers' criteria as stated in PERMENDIKNAS no. 16 even though they have a certificate a professional educator. Also, from the results of the interview obtained information, namely: 1) the absence of digital-based multimedia learning; 2) the weak ability of teachers in the use of technology so that it is challenging to be able to innovate in digital-based learning; 3) the use of smartphones by students is limited because the smartphone owned belongs to his parents; 4) the prohibition of the use of smartphones in schools during face-to-face learning; 5) the learning media used today only uses concrete objects around as a support for mathematics learning; 6) digital-based learning support components such as LCD projectors are limited in number; 7) all teachers already have laptops, and 8) students have difficulty in understanding mathematics without any tools (learning media).

The interview results can be concluded that the teacher needs learning media that all students can use through smartphones during online learning or while studying at home and the media can be used in classroom learning using the help of the teacher's laptop and LCD projector. With the limitations of teachers' ability to the latest technology, teachers hope that the media developed later in media use and easy to operate. Teachers feel that they are no longer able to develop or operate complex media.

The needs questionnaire distributed to 85 students showed some of the same conclusions as what the teacher said, among them that the smartphone used by the student belonged to his parents or brother. However, the findings are surprising that in a day, the average student uses a smartphone for 2-5 hours, and most of the time, it is used only for tinkering. So, the function of smartphones that are supposed to learn media becomes misused. Some of the other questions asked in the needs poll are presented in Table 1.

Table 1. Results of Filling the Questionnaire Needs by Students

Aspects	Questions	Answer	
		Yes	Not
Assessment of math learning in primary schools	1. Are math subjects difficult?	61%	39%
	2. Is the explanation of the teacher in math subjects elusive?	31%	69%
	3. Have teachers ever used digital learning media when teaching math subjects?	20%	70%

Availability of facilities and supporting learning media.	4. Is it in teaching math teachers using laptops and LCD projectors?	36%	64%
	5. Is there a mobile phone (smartphone) at home, and you can use the mobile phone (smartphone)?	95%.	5%
The need for interactive multimedia in the form of educational games	6. Do you know about interactive multimedia?	32%	68%
	7. Do teachers use interactive multimedia when learning mathematics?	48%	52%
	8. Do you play educational games related to math subjects?	59%	41%
	9. Do you need multimedia learning in the form of educational games to learn math?	100 %	0%

Table 1 shows that the process of learning mathematics in elementary school has not been maximized, especially in the aspect of the utilization of learning media. Aspects of difficulties and limitations in the provision of learning media are shown by 70% of students who answer that teachers never use digital learning media when teaching mathematics, and in the use of LCD projectors, only 36% of students answer that teachers have used it. Therefore, 61% of students say that math subjects are difficult subjects because teachers do not use assistive media to attract students' learning interest in the learning process. Through conventional learning, 69% of students said that the teacher's explanation is easy to understand. This needs to be appreciated, meaning that teachers have been able to teach math subjects well conventionally. Of course, it would be better if learning uses engaging learning media. So, the percentage of students who easily understand math subjects will be higher. Through the use of exciting learning media, it students are easier to understand the materials taught.

The availability of smartphones at home indicated by 95% of students can use and operate them can undoubtedly support the learning process through android-based development media. Also, with LCD projectors in schools and every teacher already has a laptop, digital-based learning media can still be used when learning in class. 68% of students said they knew about interactive multimedia, and 48% of students said that teachers had used interactive multimedia during learning. This means that digital learning media is not a foreign thing for students and teachers because they were once users. Of the 85 students, 59% said they had played educational games, and 90% said they needed multimedia learning based on educational games. Thus, approximately 30% of students have never used educational games and want an educational game developed as a learning medium.

Based on the results of interviews and questionnaires, it is known that teachers have used learning media in the form of images, real objects, and the environment. Teachers tend to use conventional learning models and use books more often as a medium of learning. Computer laboratories have been owned by several schools and only functioned for information and communication technology learning. While the class teacher never used the laboratory for math learning. Teachers only use a personal laptop connected to the projector LCD when they feel needed.

Overall, learning media helps students understand the lesson more efficiently, even if it is not yet maximized. Through the medium of learning the ability to remember students increased by 75% compared to just reading a book. Also, students are easier to understand the material systematically [36]. Learning media that is more in demand by elementary school students in interactive media is audio, audio-visual, animation, and so forth [37]. The use of learning media that does not suit students' needs and environmental conditions will be free [38]. Based on the interviews and analysis of appropriate learning media questionnaires in the form of educational games.

Educational games developed must be usable through smartphones and computers or laptops. This is following students who can only use smartphones when learning outside the school while at school students are prohibited from carrying and using smartphones. While at school, educational games can be run through the teacher's laptop displayed in the classroom with LCD projectors' help so that students can take turns using them and those who do not use them can see and give instructions. Therefore, with this educational game, teachers can apply various learning models to collaborate with the media to be developed.

IV. CONCLUSION

Currently, students need interactive learning media that can be used in online learning and face-to-face learning. The learning media in question is interactive multimedia in the form of educational games. Educational games are designed to be used through smartphones and computers or laptops. Educational games are expected to be a solution to elementary school students' learning media needs in math subjects.

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