Need Assessment of Mathematics Learning Module Based on Information Technology for Junior High School

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Abstract

This study aims to analyze the need for teaching materials in the form of Flipbook as a media of information technology K-13 mathematics learning for junior high school students in class VIII semester II. The subjects of this research are 27 students of eight grades in Junior High School 2 Sukoharjo. This research is motivated by the limited available teaching materials and lack of innovation in teaching materials, so it tends to make students bored with mathematics. Data collection techniques using non-test with research instruments are a questionnaire that needs analysis and interviews. The analysis consists of 3 stages, namely front-end analysis, student analysis, and teaching material analysis The research findings show that (1) the lack of additional textbooks / other references in learning; (2) have never used learning media and the lack of facilities; (3) teachers and students need information technology-based mathematics teaching media.

Keywords: *Learning Module; Media Learning; Need Assessment; Flipbook*

Introduction

Education in Indonesia is experiencing challenges in the era of disruption. In the era of disruption, there is inequality or instability of the conventional education system into a technology-based education system (Ivanov, 2019). Teachers and students have not fully been able to support the current education system. The government appealed to restructure national and regional management and education, reorganize the curriculum, and re-develop the learning system within the framework of education in Indonesia (Dewi et al 2019). Curriculum education in the era needs to be developed by paying attention to the readiness and needs of students, content suitability, and the process of learning evaluation.

The 21st century is known as the age of knowledge, in which, in this era, all alternative efforts to meet the needs of life in various contexts are more knowledge-based. The efforts to meet the needs of the field of knowledge-based education must have new standards of learning processes used for students so that they have the competencies needed in the 21st century. Schools are challenged to find ways in order to enable students to succeed in work and life by mastering creative thinking skills, flexible problem solving, collaborating, and innovating (Zubaidah, 2016).

In addition, schools must think about ways for graduates to be able to compete in the face of the industrial revolution 4.0, teachers need to find methods to develop cognitive capacity by applying higher order thinking skills (HOTS) (Wartono, Hudha, & Batlolona, 2018). The application of HOTS to learning systems requires specific learning strategies and models such as inquiry that are applied according to 21st century skills (Hugerat & Kortam, 2014). The era of the industrial revolution 4.0 is closely related to 21st century skills. In 21st century skills, innovation in instructional media is needed to increase student motivation and learning outcomes. Learning media innovation in the 21st century requires skills in problem solving, collaboration, communication, and critical thinking to create new things (Lay & Osman, 2018).

Educational skills of the 21st century are educational support systems that regulate student conditions in learning, accommodate student learning needs and support positive relationships between students through effective learning (Dwyer, Hogan, & Stewart, 2014). One way to make learning effective and enjoyable is to learn and use information and communication technology (ICT) (Livingstone, 2012). Information and Communication Technology is very important in supporting the advancement of education at this time (Fu, 2013). Technology is a means to develop learning materials so students are more interested in learning (Shin, 2015).

Accordingly, in this era of the industrial revolution 4.0 at this time, books have undergone a metamorphosis from print to digital form so that it is operationally more practical and more efficient. The statement is in line with Awang's opinion (Awang, 2010) that believes that digital books are an alternative technology that facilitates readers to access and read books anywhere, anytime, and quickly find relevant material without having to read the entire contents of the book. Stoykova (Stoykova, 2018) also assumes that old books can be preserved through the process of digitizing into digital books.

Electronic school books (BSE) is one of the media that is now widely used in various schools in Indonesia. BSE is packaged in the form of an ebook that displays material accompanied by pictures. To display an interactive simulation, it can be complemented by combining video, animation, and audio (Mulyadi, et al, 2016). The combination is expected to help students to visualize an abstract subject matter so that students can understand the material.

In the rapid development of technology, the learning process in the classroom is required to be able to utilize technology (Arsyad & Azhar, 2011). Teachers are required to be able to use devices that can be provided by schools. They are required to be able to develop skills in creating learning media that will be used in the media is not yet available. Consequently, teachers must have sufficient knowledge and understanding regarding the learning media. Learning media is a communication tool used to convey messages or learning materials to attract students' interest in learning materials and improve students' understanding of the content presented (Nuroifah & Nisfatun 2015). Effective learning is characterized by attitudes that emphasize effective student learning. Effective learning emphasizes on how to make students able to learn how to learn (learning how to learn), through teacher creativity, learning in the classroom becomes a fun activity (joyful learning) (Mulyasa, 2004).

Learning based on learning media leads students to interact directly with learning materials by the abilities and interests of students. Hence, it can increase and direct the attention of students, which can lead to motivation and better learning outcomes (Fadli, et al, 2017). Mathematics is an important lesson in solving everyday problems. Mathematics is not only found in Mathematics subject, but it is also very easily found in everyday life. Based on observations and interviews, the fact is that the teacher still uses the lecture method so that students become passive and very dependent on the teacher. The learning atmosphere perceived by students was still passive, making their learning motivation to decrease. During the learning process, it obtained the fact that the teacher had not utilized the devices provided by the school, such as LCD. The teacher had used a student-oriented learning method in which the students were

asked to have discussions in groups. However, some materials, such as geometry, were still considered difficult for the students to imagine. The teacher sometimes also uses teaching aids, but they are outdated and not upgraded. The use of instructional media was still rare. Learning media that were used occasionally by the teacher were in the form of PowerPoint only, and that was very infrequent to use. As a consequence of the real facts, a research problem is formulated, which is how the need for a flipbook as a technology-based learning media for junior high schools.

Method

This research uses a is descriptive method. The subjects of this study were the teacher and 27 students of eight grades junior high school. Data were collected through observation, questionnaires, and interviews. Observations were made of one mathematics teacher and to get an overview of the implementation of mathematics learning by teachers in the classroom. Interviews and questionnaires are used to determine the existing problems and the level of needs related to natural development or not. Aspects in the questionnaire consist of performance analysis, needs analysis, actual abilities, learning styles, etc. Data were analyzed using average percentage values. The categories of needs analysis are shown in Table 1.

Table 1. Likert Scale

Score	Percentage	Category
1	0 – 25	Not good
2	26 – 50	Pretty good
3	51 – 75	Good
4	76 – 100	Very good

Result and Discussion

Once the data is collected, it is analyzed through three stages of analysis, including front-end analysis, students' analysis, and analysis of teaching materials (Pebriawati, 2019). The following is a description of the results of the implementation of the analysis stage

- **Front-End Analysis**

The analysis consists of performance analysis and needs analysis. The performance analysis consists of 3 indicators, including teacher identification, obstacles in learning, and support in school facilities. Whereas the needs analysis consists of 3 indicators, including teaching materials, interests, and development of learning media. Based on the questionnaire, the results of the analysis are shown in Table 2 below.

Table 2. Result Front-End Analysis

Aspect	Indicator	Value	Category	Score Average	Category
Performance Analysis	Teacher identification	81.5 %	Very good	59.26 %	Good
	Obstacles	92.6 %	Very good		
	Supporting facilities	3.7 %	Not good		
Need Analysis	Teaching materials	18.5 %	Not good	50.6 %	Pretty good
	Interest	51.8 %	Good		
	Development of learning media	81.5 %	Very good		

Based on Table 2, it can be seen that both performance analysis and needs analysis have good and pretty good good categories. However, some indicators are considered a group that is not good. In the performance analysis, there are three indicators, including teacher identification, obstacles, and supporting facilities. The results of the performance analysis on the indicator of teacher identification show that it is in the very good category. It means that the teacher has planned, implemented, and evaluated learning well (Pebriawati, 2019). A question related to teacher identification in the questionnaire is as follows: "Is the Mathematics learning taught by the teacher so far going well?". Some 25 students from 27 students answered "yes," so the percentage of teacher identification is 81.5%, which is included in the very good category. Teachers who have high competence and performance will be able to implement the learning process well, thus affecting student learning outcomes (Sirait 2016). Teachers who have very good performance will be able to drive students' enthusiasm and motivation to learn better, which will ultimately improve the quality of learning. The results of observation show that the teacher has also strived for a student-centered learning process, but this is difficult to realize because it is often constrained so that the teacher remains teacher-centered learning. Similarly, the obstacle indicator also shows that the obstacles are also pretty good high. A question related to constraints in the questionnaire is: "Are there any obstacles encountered when learning Mathematics in geometry material?". The percentage obtained is 92.6%, which shows the very many obstacles encountered when learning Mathematics in geometry material. The inhibitor from the shift in the teacher-centered learning to student-centered learning paradigm is due to limited human resource capacity and the teacher's concern of not achieving learning targets due to limited time (Listyani, 2007).

A question related to supporting facilities in the questionnaire is as follows: "Have you ever used learning media such as PowerPoint, Adobe Flash Player, or Flipbook?". The percentage obtained is 3.7%, which indicates that the category is not good. Schools do not yet have attractive study rooms, computer laboratories, and LCDs, and small libraries. Mathematics requires teaching aids for each lesson. However, the school does not yet have adequate teaching aids. Teaching aids and libraries are essential in student academic performance (Bajaj, 2017) (Mahwasane, 2017).

Meanwhile, the needs analysis also has three indicators, including teaching material, interest, and development of learning media. Based on the results of the needs analysis of the teaching materials indicator, it shows that there are deficiencies in the teaching materials used. A question related to the teaching materials in the questionnaire is as follows: "Do you use additional textbooks (other references)?". The percentage obtained is 18.5%, which indicates that the category is not good. The teaching materials used in the school have a low level of readability, cannot lead to innovation and independence of students, and have not used a definite step of the learning model. From this explanation, it means that the books available do not have quality books, which influence student activities, this is one of the problematic learning processes that result in low learning outcomes. Teaching material has an important meaning in the learning process because it can increase the effectiveness of learning (Depdiknas, 2007). It shows that the teaching materials used still have shortcomings in supporting the learning process. The teaching materials used by the teacher always have a low level of readability, cannot lead to innovation and independence of students, and have not used a definite step of the learning model. Teaching material has an essential meaning in the learning process because it can increase the effectiveness of learning.

Next, the results of the needs analysis on indicators of interest and the development of learning media show good and perfect categories. That means that the students indeed want a change in Mathematics learning because Mathematics subject tends to be tedious and challenging to understand. A question related to the interest in the questionnaire is: "Is the learning media (PPT, Adobe Flash Player, Flipbook) interesting and encouraging learning?" Out of 25 students, 14 students chose "yes" answers. Thereby, the interest indicator has a percentage of 51.8%, which is included in a good category. While for the development of learning media, the question: "Does it need to develop learning media to support

Mathematics learning, especially in geometry material?". The percentage of this indicator is 81.5%, which is in the perfect category. This means that the students are very enthusiastic about learning based on learning media.

One of the learning media that is expected to create an interesting and conducive learning atmosphere is the use of Flipbook media (Mulyadi, et al, 2016). By using this learning media, it is expected to provide updates in the learning process in class. According to the Teknokids animation website, flipbooks are one type of classic animation made from a stack of paper that resembles a thick book, on each page the process is described about something that later the process looks moving or animated (Ramdania, et al, 2010). The use of Flipbook media can enhance students' creative thinking and can also influence student achievement or learning outcomes (Ramdania, et al, 2010). The use of flipbooks can also increase understanding and improve learning achievement (Nazeri, 2013).

- **Students' Analysis**

Characteristics of students can be seen from three aspects, including aspects of actual abilities, learning styles, characters (Pebriawati, 2019). Each element is composed of each indicator. The results of the students' analyses are based on observations, as shown in Table 3.

Table 3. Result Students' Analysis

Students' Analysis	Indicator	Value	Category	Score Average	Category
Actual Ability	Creativity	51.7 %	Good	72.4 %	Good
	Motivation	93.1 %	Very good		
Learning Styles	Visual	100 %	Very good	93.1 %	Very Good
	Auditorial	86.2 %	Very good		
	Kinaesthetic	93.1 %	Very good		
Characters	Characters Towards Learning	86.2 %	Very good	86.2 %	Very Good

As shown in Table 3, the results of the students' analysis as a whole are considered very good. In actual abilities, indicators of creativity and motivation are in the good and very good categories. The results of the analysis of learning styles show that all types of students' learning styles are in the very good category, with a more dominant visual learning style. The results of the analysis of characters towards learning are also in the very good category.

In actual abilities, indicators of student creativity in solving problems and logical thinking are not optimal. The analysis of students' learning styles shows that the highest percentage of the students' learning styles is the visual learning style. This means that most students receive lessons related to images and colors that stimulate the ability of the right brain.

Based on Front-End analysis and students' analysis, media-based learning is needed to help teachers overcome students' learning difficulties. One of the learning media that is suitable for today's character is the Flipbook, in which the media is flexible in providing pictures, colors, sounds, and even animations that make students not bored and motivated to learn Mathematics.

- **Analysis of Teaching Materials**

The references used in the learning process are textbooks from schools that are by the 2013 curriculum, which are student worksheets. However, this reference is considered to be lacking, especially to develop students' abilities. Based on the analysis of teaching materials in Junior High School 2 Sukoharjo, it shows that the books used are also less supportive in the learning process that is currently still teacher-centered. The language used in the student worksheets is challenging to understand because it is based on assignments; therefore, the basic concepts are not yet proper. This makes it more difficult for students to learn Mathematics using these teaching materials.

Through the three analyzes, it can be seen that the development of learning modules is essential due to the lack of active students in learning activities and is still teacher-centered. At the same time, the teaching materials are too monotonous. Based on the open questionnaire provided, it is known that students of grade VIII are still experiencing difficulties in learning Mathematics, one of the reasons is that the books used are still not understood by students.

The solution to the learning problems encountered by students in the development of teaching materials using IT-based learning media which can be alternatives and solutions to students' needs for geometry material. Kvisoft flipbook maker is software for developing electronic-based learning modules. Modules are materials designed to learn independently by students in the learning process.

Based on previous studies and the results of field research on the application of technology in Mathematics, the development of appropriate multimedia can improve the quality of Mathematics learning. Flipbook (e-book) multimedia, which has hypermedia characteristics, has more interesting features than printed books. Based on the literature review, Flipbook learning media can increase students' interest in learning geometry (Arsyad & Azhar, 2011).

It is expected that the development of mathematics learning media can help students in understanding theory and become a source of learning mathematics in SMP Negeri 2 Sukoharjo so that students are expected to be able to achieve the competencies that have been set and increase students' mathematical abilities.

Conclusion

This study analyzes the need for a flipbook as an IT-based learning medium in junior high school. There are three analyses: front-end analysis, student analysis, and material/teaching material analysis. The results of the front-end analysis show indicators of teaching materials, and student needs are categorized as sufficient. The observation shows that the teaching materials used have a low level of readability, cannot lead to innovation and independence of students. The number of obstacles and support facilities from schools is still small for learning that involves the media. Analysis of students shows that the most dominant learning style of students is visual. So it is very supportive of the development of Flipbook learning media. The material analysis shows that the teaching materials used in schools are only worksheets and do not use other textbooks. Therefore, the authors feel the reference for learning is lacking.

This research has the implication that teachers should apply attractive learning models and learn technology to improve the quality of learning in the classroom. One of the learning technologies that teachers can apply is learning media, one of which is a flipbook.

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