The development of an android-based e-module to increase student's critical thinking skills: a comprehensive needs analysis

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**ABSTRACT**

Education in the 21st century becomes important to ensure students have the skills to learn and innovate, the skills to use technology and information media, and can work, and survive by using the skills to live. In an era of increasingly sophisticated technological developments, it would be nice if these technological developments were used to create interesting and fun innovations during the learning process, such as using teaching materials based on information technology to support the learning process. The purpose of this research is to analyze the need to develop an Android-based mobile E-Module. The method used was descriptive qualitative research method, namely by conducting a needs analysis. Research data were collected through observation and interviews with fifth grade teachers and 30 students. The results of observational research indicated that students’ critical thinking attitudes are still very low and learning uses textbooks, and they still rarely use electronic media such as computers or androids to teach. Dealing with the pre-research conducted that teachers and students had desire that the teaching materials used in the learning process were developed so that they varied and facilitated to understand the material.

**KEYWORDS**

Android Mobile; learning; critical thinking; e-modul

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**Introduction**

Education is the main key in the process of forming the individual to be more qualified and superior so that they can help change and develop in a better direction. Education is the most important thing in life. According to Law No. 20/2003, education is a conscious and planned effort to create a learning atmosphere and learning process so that students actively develop their potential so that they have religious spiritual strength, self-control, personality, intelligence, noble character, and skills needed by themselves, society, nation and state.

Education is a field that has an important role in creating competent human resources in the 21st century now. Education is currently in the knowledge age with an extraordinary acceleration of increasing knowledge. Education in the 21st century is becoming increasingly important to ensure that students have the skills to learn and innovate, the skills to use technology and information media, and can work, and survive by using life skills (Arifin, 2017). Learning mathematics in the 21st century has objectives with 4C characteristics, namely; Communication, Collaboration, Critical Thinking and Problem Solving, Creativity and Innovation. (Usman & Enggar Utari, 2020).

Thinking ability is an ability to process mental operations which include knowledge of perception and creation (Fauziyah et al., 2020). Thinking ability is an ability to use the mind to find meaning and understanding of something, explore ideas, make decisions, think about solutions with the best considerations and revise problems in the previous thought process (Meriani et al., 2019).

Thinking skills are abilities and these are abstract, cannot be seen before being proven by concrete activities. Thinking ability is a scientific discipline that can be learned and practiced in the form of norms or experience. Based on some of the opinions above, it can be said that the ability to think is an ability to process the mind to find, explore, and make decisions (Yunita et al., 2019).

Thinking abilities are divided into two parts, namely low-order thinking skills (Low Order Thinking Skills or LOTs) and higher-order thinking skills (Higher Order Thinking Skills or HOTs) (Arifin, 2017). Students’ higher-order thinking skills are one of the barometers of the nation’s intellectual level. As agents of change, students must be able to show their identity in intellectual, moral, and elegant ways (Ariyati, 2012), Therefore, in the 21st century, the

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learning process carried out in schools and colleges must really be considered to produce competent graduates. HOTS referred to in this study is the ability to think critically (Lashari et al., 2017).

Critical thinking is rational thinking that requires the ability to evaluate a statement and identify a reason, for example the evidence that underlies the evaluation (Khashim, 2020). Critical thinking is reasoning and reflective thinking with an emphasis on making decisions about what to believe or do (Kane et al., 2016). There are 6 indicators that play an important role in critical thinking attitudes, namely asking and answering questions, drawing conclusions and the necessary similarities, collecting and compiling the necessary information, formulating problems, finding ways that can be used to solve problems, and analyzing arguments. Students who can show 6 indicators of critical thinking attitudes will understand more deeply about the material being taught and find a lot of new information so that student learning outcomes can improve (Amanda et al., 2018). A good learning system will produce good quality educators (Noula, 2018). The curriculum used in the learning process has developed from time to time. These developments occur because of the demands of advances in science and technology as well as the needs in life (Nugroho et al., 2019). The development of each curriculum is an improvement from the previous curriculum. The basic concept of the 2013 curriculum is in an effort to simplify and its thematic integrative. Integrated thematic learning with a scientific (scientific) approach. In thematic learning also uses an assessment (authentic assessment) which assesses the readiness of students, processes, and overall learning outcomes.

The learning process will run effectively and efficiently if it is supported by the availability of teaching materials as supportive learning media (Feriyanto & Putri, 2020). An educator is required to master several strategies and learning models that can strengthen students' thinking in making learning active. But in reality the opposite is happening, educators still do not really understand the importance of using strategies and teaching materials in the learning process. Educators not only master what must be learned (content) but how to teach students who are challenging, fun, motivating, inspiring and giving space to students to perform process skills, namely observing, asking, finding out (Syahfitri et al., 2019). Indirectly, various problems arise from the application of teaching materials as a medium for delivering messages.

This problem was also found based on the results of observations and interviews with fifth grade educators at SD Negeri 5 Sumberrejo, it was obtained information that the learning process in the classroom still tends to use conventional strategies. Educators only use printed books/texts purchased from publishers as the only source of learning materials. The learning process in class is only in the form of explanations of concepts and theories, then giving examples of questions to students. When educators give assignments that are not the same as the examples, they feel confused and find it difficult to complete them. So that the Basic Competence (KD) obtained by students has not reached the Minimum Completeness Criteria (KKM). Learning is more applying teacher centered approaches, namely the teacher becomes the information center for students. Learning has not constructed students' knowledge and supports actualizing their academic potential, personality, and creativity so that it shows evidence that students produce critical and creative thinking.

In an era of increasingly sophisticated technological developments, it would be better if these technological developments are used to create interesting and fun innovations during the learning process, such as using teaching materials based on information technology to support the learning process (Asrial et al., 2019). In accordance with the development of the times, namely in the field of technology, teaching materials used are no longer only in the form of reading books, but some are in the form of articles, electronic books or commonly abbreviated as e-books, as well as electronic modules or commonly abbreviated as e-modules. can be accessed from the internet, so that it makes it easier for students to access it (Polajnar, 2021).

Printed modules are books written with the aim that students can study independently without teacher guidance, so that the module contains all the basic components of teaching materials. Modules can be said to be meaningful if students can use them easily. Learning by using modules can increase student learning time so as to shorten the difference in student learning time, and can minimize student dependence on teachers (Handoko et al., 2016). Therefore, the modules used in the learning process must develop the basic competencies that will be achieved by students, and use good, interesting language, and are equipped with illustrations.

Education currently is greatly influenced by the development of information and communication technology. One of the forms of technology that has supported educational activities is the use of smartphones with Android operating system technology (Wiranda & Adri, 2020). The android operating system presents an application for student learning media, namely the android e-module. Based on the name of the application, it can be seen that the Android e-module application is made using Android technology which is a system for smartphones and tablets. Android is an operating system that connects e-modules with users, so that users can run available applications (Wiranda & Adri, 2020).

Android is an operating system on Linux-based mobile devices that includes an operating system, middleware and applications. Android provides an open platform for developers to create applications. The Android architecture consists of Application, Application Framework, Libraries, Android Runtime, and Kernel (Jaya, 2016). The existence of the android system along with the android platform makes it easy to develop applications.

The Android-based e-module is a development of the print module which was developed with the help of android technology (Prastyaningrum & Handhika, 2017).

The android e-module was developed based on the writing characteristics of the print module, the only difference being that there are a few things. The differences between the print module and the android e-module are: displayed on a monitor or computer screen, more practical to carry everywhere, using a CD, USB flash disk, or memory...
card as a data storage medium, production costs are cheaper, using electric power resources to optimize it, and equipped with audio and video in one device (Vebrianto Susilo et al., 2020). E-modules with the help of Android technology also have other advantages in their use, namely that they can be accessed or studied in the form of text and images, videos without using internet network services or can be used offline (Elmasari, & Anggara, 2021). The android e-module can also be used online to ask questions about what has not been understood from the material in the e-module through the comments column provided (Al Rasyid & Partana, 2021).

According to (Gufran & Mataya, 2020) the preparation of e-modules has elements related to the technology used, which are as follows:

a. It is intended to increase student interest in learning.

b. It is written and designed for use by students.

c. Explain the learning objectives

d. It is compiled based on a flexible learning pattern.

e. It is compiled based on student needs and achievement of learning objectives.

f. It is focused on providing opportunities for students to practice.

g. Accommodates learning difficulties, requires careful navigation.

h. Communicative, interactive, and semi-formal writing style.

i. It requires learning strategies.

j. It has activities that generate feedback.

k. It supports self-assessment.

l. There needs to be instructions before and after using the android e-module.

E-modules are arranged based on the steps for the preparation of the print module, namely:

a. Curriculum analysis

   Mapping competency standards, basic competencies and indicators to determine what material will be delivered in the module.

b. Determination of module title

   The determination of the module title should be in accordance with the basic competencies or the main material contained in the syllabus.

c. Module code assignment

   Provision of module code aims to facilitate the management of the module.

d. Writing a module.

Methods

This study is a type of qualitative descriptive research. In this study, an analysis of the need for learning methods was undertaken. The analysis was undertaken thoroughly regarding the use of teaching materials in the school. This study was conducted in March 2022. The place of research is at SD Negeri 5 Sumberrejo Kemiling.

The technique was taken by interviewing and direct observation of the learning methods at the school. Interviews were conducted with 5th grade teachers and 30 students. Teachers were given questions about teaching materials at the school. The next stage is to make observations by observing directly the situation at the time of learning at school. The function of observation is also to strengthen the analysis. The data from the interviews were analyzed descriptively. The analysis is directed to the reasons for the low or high use of learning methods. The results of data analysis in the form of a descriptive description.

Results and Discussion

The researcher conducted observations at SD Negeri 5 Sumberejo on March 21, 2022. Observation results show that students’ critical thinking attitude is still very low. This is evidenced from the results of observational data obtained from critical thinking attitudes which only reached a score of 48 out of a maximum score of 100. This shows that almost 70% of students still have a low critical thinking attitude. This can be seen from the number of students who are still silent and only accept the material being taught. Many students are still daydreaming and not interested in learning. Based on the indicators used, only 2 indicators are visible to students from 6 indicators. The indicators that are seen are still very general, for example answering the teacher’s questions. This happened because of the application of conventional learning models. The learning model used by the teacher has not directed students to a critical thinking attitude.

Besides to observations, the researcher also looked at the daily value data of students on the concept of breathing in humans and animals. Data on student learning outcomes seen by researchers showed that less than 50% of students scored above or equal to the specified minimum completeness criteria (KKM). Improving the quality of education can be achieved through improving the quality of learning (Amanda et al., 2018).
Dealing with diagram 1, data is obtained that 40% or as many as 12 students usually use library books provided by the school, 30% or 9 students usually use LKPD, 20% or 6 students use the internet, and the remaining 10% or as many as 3 students use modules.

From diagram 2 obtained data that the total number of students in the sample class are 17% or as many as 5 students who really like the learning resources they have been using, 20% or 6 students like, 40% or 12 students do not like, and 23% or 7 students really did not like the learning resources they used to use. Based on the two diagrams above, it can be analyzed that most of the students in the sample class do not really like the teaching materials they have used so far. This is definitely a homework for educators, to develop materials to increase student interest and interest in learning. So that it can improve student learning outcomes.

Diagram 3 shows the results of the questionnaire which types of teaching materials do students prefer, which is obtained as many as 53% or 16 students choose audio-visual teaching materials, 27% or 8 students choose visual teaching materials, and only 20% or as many as 6 students choose the type of teaching materials, audio teaching materials.

Responding to diagram 4 obtained the results of the questionnaire related to the need or not to develop e-modules to support the learning process, namely 60% of the total number of students in the sample class or as many
as 18 students said it was very necessary, while as many as 27% or 8 students said it was necessary and the remaining as many as 4 people or 13% of the total number of students in the class said it was not necessary. From the data obtained, it is necessary to make efforts to improve the development of teaching materials in this case in the form of e-modules in order to further increase student interest in learning. Based on the results of interviews conducted by researchers with one of the teachers, Mrs. Tuti Raeni, S.Pd., in which the interview was conducted at SD Negeri 5 Sumberrejo, it was obtained information that for learning at this school there are still many use of textbooks, and still rarely use electronic media, such as computers and androids for teaching. Thus in general we can draw a conclusion that one of the problems in the learning process. carried out at SD Negeri 5 Sumberrejo lies in the teaching materials used are less varied and result in students feeling bored easily during the learning process. Based on the pre-research, we can give conclusion that students want or desire that the teaching materials used in the learning process are developed so that they are varied and facilitate understanding of the material.

This is also supported by research (Al Rasyid & Partana, 2021) who got the results of the Android-based e-module are very good and suitable to be used as learning media. Besides, research by oleh (Elmasari, & Anggara, 2021) found that android-based e-modules were effective for use in learning. Students are very enthusiastic in learning so that they get better learning outcomes. Furthermore, research by (Puriyati, 2018) found that e-modules based on android applications were very effective for use in learning at school.

Conclusion

Regarding to results of the needs analysis, it can be concluded: the critical thinking attitude of students is still very low. This is evidenced from the results of observational data obtained from critical thinking attitudes which only reached a score of 48 out of a maximum score of 100. This shows that almost 70% of students still have a low critical thinking attitude. This can be seen from the number of students who are still silent and only accept the material being taught. Many students are still daydreaming and not interested in learning. Based on the indicators used, only 2 indicators are visible to students from 6 indicators. The indicators that are seen are still very general, for example answering the teacher's questions. This happened because of the application of conventional learning models. Based on the results of observations and interviews with fifth grade educators at SD Negeri 5 Sumberrejo, information was obtained that the learning process in the classroom still tends to use conventional strategies. Teachers merely use printed/text modules purchased from publishers as the only source of learning materials. The learning process in the classroom is only in the form of an explanation of concepts and theories. The learning model used by the teacher has not directed students to a critical thinking attitude. Printed modules are books written with the aim that students can study independently without teacher guidance, so that the module contains all the basic components of teaching materials. Modules can be asserted to be meaningful if students can use them easily. The android e-module was developed based on the writing characteristics of the print module, the only difference is that there are a few things. The differences between the print module and the android e-module are: displayed on a monitor or computer screen, more practical to carry everywhere, using a CD, USB flash disk, or memory card as a data storage medium, production costs are cheaper, using electric power resources to optimize it, and equipped with audio and video in one device. With the Android-based E-module, it is expected that it can build students to be more enthusiastic in learning and can improve students' critical thinking. Based on this, it is necessary to develop an Android-based E-module for class V students in accordance with the 2013 curriculum. This e-module is also expected to be able to improve students' critical thinking skills in learning. Based on the conclusions and implications that have been described previously, the researchers provide the following suggestions: 1) it is necessary to conduct further research, namely the development of Android-Based E- Modules to improve students' critical thinking skills. 2) Elementary school teachers are also expected to be able to develop and use Android-based E-Modules to improve student learning activities.

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