Study of Needs for the Development of PBL-Based E-Modules to Improve Numeracy Literacy

Abstract: This study intends to ascertain whether e-modules based on problem-based learning (PBL) on numbers should be produced, when the current teaching resources are textbooks. For students, the supply of textbooks became a concern. The abstract issues in the textbook that pupils must solve continue to stump them. A descriptive approach is employed in the research method, which is qualitative. The information was gathered by giving questionnaires to 30 pupils who are familiar with the notion of numbers and by speaking with three math teachers at the school. The findings of this study (1) demonstrate that students require cutting-edge instructional materials in the form of e-modules. (2) To prevent students from getting easily bored while studying, PBL-based e-modules are not only delivered in written form; they can also be integrated to videos and animations.

**INTRODUCTION**

A humanistic method of growing in accordance with life's ideals is through education. A country's advancement can also be measured by its level of education since as that country's educational system grows, so too will its culture. The employment of technology in education is also inextricably linked to its ability to facilitate teaching and learning. The advancement of science and
technology (IPTEK) is accelerating quickly in the age of globalization. Education today is directly related to science and technology.

Teachers must be able to incorporate science and technology into their lessons since doing so will allow students and teachers to rapidly access material from a variety of sources and pique students’ interest in learning. Computers, videos, radios, the internet, LCD projectors, and other learning media can all be used in the classroom to improve students’ learning outcome. If a teacher uses an interesting technology-based learning media, it can stimulate the students’ thoughts, feelings, concerns and interests in such away in order to ensure that the learning process becomes more effective (Nurlaila et al., 2022).

Mathematics is a necessity for all students because mathematics is related to daily life (Sirait, 2016). In addition, mathematics learning aims to equip students with problem-solving skills, arithmetic literacy, logical thinking, abstract, systematic, and creative skills. Therefore, studying mathematics is a quality resource for students.

One of the materials in the 1st semester of mathematics class VII is numbers. Based on the curriculum, there are a number of materials at each educational level VII students are taught a number of materials and, from the research results, students, VII. Because of these difficulties, which result in poor student learning outcomes, they experience various difficulties, including difficulties in analyzing and classifying data types and displaying them in diagrams or tables. In the number material of the 1st period, SMP Negeri 2 Betara. This can be seen in Table 1 in the daily test scores for the number of materials for the last five years at SMP Negeri 2 Betara.

The number material is closely related to the daily environment, so it can cause problems. Therefore, a number of materials are suitable for teaching with problem-based learning or PBL (problem-based learning). It is expected that the PBL approach will improve students' reasoning, communication and convection in problem solving, thus increasing their intellectual potential (Syafitri et al., 2021).

The PBL (Problem Based Learning) model is suitable for learning that requires students' thinking skills in solving contextual problems. PBL (Problem Based Learning) is a teaching model that focuses on problems in order to develop problem-solving, communication, material, and self-regulation skills (Kauchack & Eggen, 2012). PBL (problem-based learning) it is expected that the PBL approach will improve students' reasoning, communication and connections in problem solving, thus increasing their intellectual potential.

The PBL (Problem-Based Learning) model is suitable for learning that requires students' numerical literacy skills in solving contextual problems. Numbering can be defined as the ability to apply number concepts and arithmetic processing skills in everyday life (for example, at home, at work, and in participation in community life and as a citizen) and the ability to interpret quantitative information around us. This ability can be trained to learn math with the help of technology.

The use of digital and information environments in education has led to the emergence of e-learning in the education world. E-learning is learning using the internet, intranet/extranet, audio/video, CD-ROM, computer-based training (CBT), and other electronic media that can be used to

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<th>Years</th>
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<tr>
<td>2017</td>
<td>50.56</td>
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<td>2018</td>
<td>52.00</td>
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Table 1 material based on daily test results

2019 | 43.59 | 50.65 | 62.50 | 52.25 |
2020 | 55.79 | 56.80 | 58.75 | 60.50 |
2021 | 44.21 | 50.25 | 45.50 | 50.25 |

Source: SMP Negeri 2 Betara's documentation
present or provide learning materials. In the concept of e-learning, learning grows and diversifies, one of which is electronic modules (E-modules) based on mobile devices (Fitria & Idriyeni, 2017; Othman & Adnan, 2021; O. R. Pratama & Risdianto, 2021; Qomalasari et al., 2021). The number concept e-module will be developed in this research and will be used to assist the learning process during the COVID-19 pandemic, where learning is carried out online at home using blended learning (a combination of online and offline), as well as to develop and improve students' numeracy literacy skills.

Innovation from the development of teaching materials in the form of electronic modules (e-modules), which are books in the form of soft files that can be opened and read by students anywhere and anytime (Deviana & Sulistyani, 2021; Galadima et al., 2019; Qomalasari et al., 2021; Utami & Yuwaningsih, 2020). Various studies indicate that there is a need to develop textbooks with interesting electronics-based modules so that students can change their way of thinking. That is, mathematics is not a difficult subject and is very interesting (Awaliyah, 2019; Azizah et al., 2020; Ikashaum, 2019; Nadia et al., 2022; Rahmi, 2018; Rosmalinda et al., 2013). Various studies have shown that using e-modules in learning mathematics can improve critical thinking skills (Ikashaum, 2019; Kurniati et al., 2013; R. Pratama et al., 2022; Vahlia et al., 2021); mastery concepts (Kamid et al., 2021); improving learning outcomes. (Febrianto et al., 2015; M. Pratama et al., 2018); building concepts (Fitri et al., 2019); enhance numeracy literacy (Kadek et al., 2022); increase creativity (Auliah et al., 2020; Laksono et al., 2021); and developing problem-solving skills (Dewi et al., 2019; Maiyusriani et al., 2020).

The results of the observations in the learning process showed that there were only a few students who brought the used mathematics textbooks. The teacher is still the main source of learning, while in the 2013 program, the teacher was only a facilitator. The textbooks distributed by the school are still presented in a monotonous way, consisting only of text and pictures, so students’ interest in learning mathematics is very low. Therefore, it is necessary to develop teaching materials in the form of e-modules, which not only contain text and images, but can also be inserted into videos, animations, and hyperlinks.

The aim of this study is to determine the need for PBL-based e-modules to be developed to improve students' numerical literacy. The results of this study are expected to provide preliminary information about the e-module, which will be developed to improve students' mathematical literacy and can be used as a support source in learning mathematics.

METHOD

The research method used in this study is descriptive. The tool used in this study was a questionnaire and interview instructions. The students were given a tool in the form of a questionnaire containing questions about learning mathematics, the necessity of teaching materials, and the use of technology in learning. Data from interviews with teachers is used to identify the need to develop teaching materials in the form of e-modules, barriers to learning mathematics, and the need for arithmetic in learning mathematics.

The obtained data was then analyzed according to the four-stage theory of Miles and Huberman. These stages are; data collection, data reduction, data presentation, and inference (Miles et al., 1992). The data collection phase was completed by SMP Negeri 2 Betara, VIII and IX, who had worked on the issue material at Tanjung. The research was carried out by conducting interviews with mathematics teachers using a tool in the form of interview instructions and distributing tools in the form of a questionnaire. Jabung Barat Regency,
Jambi Province. The data reduction phase is performed simultaneously with the data collection phase and is performed repeatedly until conclusions are reached. The data reduction phase is accomplished by sharpening, classifying, orienting, extracting redundant data, and organizing the data so that conclusions can be drawn. Then the obtained data was selected.

In the data presentation phase, the obtained data is presented in the form of narrative text supported by tables, graphs, and columns. All are designed to combine information to draw conclusions. After the data has been presented completely and accurately, the final step is to draw conclusions. Conclusions are drawn objectively and in accordance with the data obtained.

RESULTS AND DISCUSSION

The development of PBL-based mathematics e-modules as teaching materials aims to improve numeracy literacy in schools, facilitate students' learning, enhance the teacher's environment while performing classroom learning activities, and increase students' knowledge and understanding. consists of subjects in mathematics.

As an introduction to the PBL-based e-module, needs analysis studies are carried out to develop digital literacy based on needs.

a. Student questionnaire

Student questionnaires were distributed to 8th and 9th grade students who had previously learned numbers in 7th grade using a needs analysis questionnaire consisting of 3 sub-variables: learning achievement, mathematics learning resources, and ICT use. From three subvariables to four indicators, namely learning outcomes subvariable, KKM The learning resources subvariable for mathematics has two indicators: presentation of material in printed books (4 statements) and indicators of use of learning resources (6 statement items). sub-variables of ICT use and the indicators of technology use by students (6 statements).

Sub Variables of Achievement of Learning Outcomes

The indicator of student achievement for the sub-variable of learning outcomes, namely Mathematics KKM, the results can be seen in Figure 1.

![Figure 1 Sub Variable : Achievement of Learning Outcomes](image1)

From the picture above, the indicators of presenting material in printed books indicate that 50% of students focus on learning to use digital resources rather than reading printed books, while 4% of students understand math concepts without reading them. more printed books from the internet.

Sub Variable Mathematics Learning Outcomes

This variable has 2 indicators, presentation of material in printed books and use of digital learning resources. The results can be seen in Figure 2.

![Figure 2 Sub Variable : Mathematics Learning Resources](image2)

(a) Presentation of material in textbooks, (b) Use of Learning Resources
From the picture above, the indicators of presenting material in printed books indicate that 50% of students focus on learning to use digital resources rather than reading printed books, while 20% of students understand math concepts without reading them. more printed books from the internet.

In the indicator regarding the use of picture learning resources, it is seen that 41% of students stated that they were more interested in learning with digital and online modules, while 24% stated that the modules provided by the teacher were clearly defined. mathematical concepts.

**Sub Variable ICT Utilization**

The indicator for this variable is the use of technology by students, with the results shown in Figure 3.

![Figure 3 ICT Utilization](image)

From the picture above, it is seen that 50% of the students stated that using a laptop, mobile phone, and internet can help them learn mathematics and that they need a digital module while learning mathematics, while 6% of them stated that they learned mathematics as follows. Reading printed books.

b. Teacher interview

Interviews were held with mathematics teachers who discussed the concept of number, the shape of the modules/teaching materials used in learning mathematics in schools, the advantages and disadvantages of the teaching materials/modules used, and the difficulties and barriers students face in learning mathematics. Whether there is a need for electronic-based modules by teachers, online learning in mathematics, whether mathematical literacy in schools is beginning to develop, whether students need mathematical literacy.

The results of the interviews with the teachers are as follows:

1. Difficulties and obstacles in students' learning mathematics related to the concept of numbers are found in finding other learning resources and learning environments that can facilitate students' understanding of mathematical concepts, in addition to the concept of numbers, as well as in addition and subtraction materials.

2. The form of modules/teaching materials used in learning mathematics in schools. The teaching materials used by teachers in learning mathematics are textbooks published by the Ministry of Education and Culture and teacher handbooks of other publishers. So far, learning using these materials is student-centered and teacher.

3. The weaknesses of the teaching materials/modules used by the teacher, the teaching materials/modules used are not
yet digital, and the material in the textbook is less interactive as it is very extensive.

4. Yes, an online-based electronic module is needed in learning mathematics. It is necessary because the use of e-modules will allow students to focus more on understanding the material and modules.

5. Whether mathematical literacy in schools is being developed or not, whether only basic literacy is developed in the school literacy movement program in schools, and whether mathematics literacy is still not fully understood by teachers and students.

6. Whether students really need mathematical literacy is very important considering that mathematics literacy is also included in the ANBK material, as well as the results of international studies such as TIMSS and PISA, considering that the literacy skills of students in Indonesia are still relatively low.

The factors that affect the quality of learning are educators and students (Hamalik, 2004; Slameto, 2010). In addition, quality learning consists of the dimensions of the model used, the strategies and methods used, the media used, and the learning resources used (Djamarah et al., 2010; Slameto, 2010).

The results of the analysis of questionnaires and interviews with students and teachers in mathematics learning include that some students tend to be passive in the learning process, the teacher is still the main source of learning, or the learning is still teacher-centered, so learning is still teacher-centered. The 2013 curriculum was not implemented in the best way. In the 2013 curriculum, it seems that the learning is student-centered and the teacher is only the facilitator. Students' motivation to learn is still lacking. This may be because many of the things that determine the learning model are not suitable for the student's character, the media used by the teacher do not attract the attention of the students, or the learning resources are less supportive or monotonous. Don't innovate.

Teachers' knowledge of the use of technology in learning mathematics is still insufficient, so while teachers cannot use various learning resources, students still think that technology (mobile phones) is limited to just using social media and playing games.

When learning mathematics, teachers often use PPT as a tool in the learning process. A PPT is the result of the teacher's own doing. However, most PPTs made by teachers contain only text, while only a few images and videos are shown. Meanwhile, if only using PPT, many students who don't want to write use their cell phone cameras only to take pictures of the material, so at the next meeting there are some students who do not understand and do not understand the material when asked about it because there are no reviews or notes there.

Teaching materials are all materials used to assist teachers in performing teaching and learning activities in the classroom (Prastowo, 2012). Teaching materials have an important place in the learning process. The appropriate use of teaching materials can save time in teaching. The learning process becomes more interactive and effective.

Teachers can develop teaching materials in the form of e-modules. The e-modules can be used online or offline. The advantages of using the e-modules online are that students can access the provided links. When the material in the Flipbook is not available, the students
can get detailed information about the materials that are not included. flipbook

Teaching materials that can be made in an innovative way to attract students' interest and motivation to learn mathematics are e-modules. The e-module to be developed is a PBL-based e-module that can improve the digital literacy skills of SMP Negeri 2 Betara students.

The development of PBL-based e-modules is often used to improve literacy and numeracy. It is about what will be planned in the e-module to be developed in such a way as to have competencies characteristic of mathematics or numeracy literacy in the development of e-modules. These characteristics include aspects of numerical literacy, which includes several core competencies: mathematical thinking and reasoning; mathematical argumentation; mathematical communication; mathematical modelling; problem posing and solving; representation; symbols; tools; and technology (Rizki & Priatna, 2019).

Product development in the form of PBL-based e-modules is an assessment of the importance of technological skills for future generations interested in the relationship between literacy and product development. As access to technology becomes more abundant, education must recognize the expanding potential of these technological advances (Letwinsky, 2017).

CONCLUSION
The problems faced by teachers and students in the process of learning mathematics on a number of materials can be overcome by providing online and offline learning materials that students can study independently, so that students can fully understand the material anytime and anywhere. From the results of the needs analysis that has been done, it is necessary to develop teaching materials in the form of a PBL-based module to facilitate mathematics learning. PBL-based e-modules for developing digital literacy have an attractive appearance so that students do not get bored easily when using PBL-based e-modules. In order for students to have numerical literacy skills, e-modules should also be structured in a clear, systematic, and user-friendly language that students can understand. And also.

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