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ORIGINAL

Does Adaptive e-Module (Ae-M) effective in enhancing students' numeracy literacy ability?

Resulta eficaz el módulo electrónico adaptativo (Ae-M) para mejorar la capacidad de cálculo y lectura de los alumnos?

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ABSTRACT

Numeracy literacy is an important skill for students to master. Nevertheless, the numeracy literacy ability of students who were still low. For this reason, it is necessary to design textbooks that are suitable for students with different learning styles. Ae-M is a digital teaching material designed for students with different learning styles. Learning using Ae-M is suitable for differentiated learning strategies which are peculiarities of the independent curriculum in Indonesia. Differentiated learning views all students as having their own uniqueness in learning. Numeracy literacy ability is one of the learning objectives in the independent curriculum. The purpose of the study was to reveal whether the use of Ae-M was effective in enhancing the numeracy literacy ability of students. This type of research is development research with the Plomp model which consists of three phases, namely preliminary research, development or prototyping phase, and assessment phase. The instruments used are interview guidelines, observation sheets, checklists, questionnaires, and numeracy literacy ability tests. The results showed that Ae-M was able to facilitate students according to their learning styles and improve numeracy literacy ability. The use of video is able to facilitate visual and auditory students in learning. With activities that use digital media, kinesthetic students can do learning according to their learning style. The conclusion of this research is Ae-M was effective in enhancing the numeracy literacy ability of students.

Keywords: Literacy Numeracy; Adaptive e-Module; Learning Style; Plomp Model.

RESUMEN

La alfabetización numérica es una habilidad importante que los alumnos deben dominar. Sin embargo, la capacidad de cálculo de los alumnos sigue siendo baja. Por este motivo, es necesario diseñar libros de texto adecuados para alumnos con diferentes estilos de aprendizaje. Ae-M es un material didáctico digital diseñado para alumnos con diferentes estilos de aprendizaje. El aprendizaje mediante Ae-M es adecuado para las estrategias de aprendizaje diferenciado, que son peculiaridades del currículo independiente en Indonesia. El aprendizaje diferenciado considera que todos los alumnos tienen su propia singularidad en el aprendizaje. La alfabetización numérica es uno de los objetivos de aprendizaje del plan de estudios independiente. El objetivo de este estudio era determinar si el uso de Ae-M resultaba eficaz para mejorar la capacidad numérica de los alumnos. Este tipo de investigación es una investigación de desarrollo con el modelo Plomp, que consta de tres fases: investigación preliminar, fase de desarrollo o prototipo y fase de evaluación. Los

instrumentos utilizados son guías de entrevista, hojas de observación, listas de control, cuestionarios y pruebas de capacidad de alfabetización numérica. Los resultados mostraron que Ae-M era capaz de facilitar el aprendizaje de los alumnos en función de sus estilos de aprendizaje y mejorar su capacidad de cálculo. El uso del vídeo facilita el aprendizaje de los alumnos visuales y auditivos. Con las actividades que utilizan medios digitales, los estudiantes kinestésicos pueden realizar el aprendizaje de acuerdo con su estilo de aprendizaje. La conclusión de esta investigación es que Ae-M fue eficaz para mejorar.

Palabras clave: Pensamiento Creativo; Estudio Comparativo; GeoGebra; Aprendizaje Matemático.

INTRODUCTION

Indonesian students at the time still experience problems in learning mathematics, especially numeracy literacy. The numeracy literacy ability of Indonesian students is still low because Indonesian students are less familiar with problems that are context problems in real life [1] and are not used to solving a real problem. [2] Students are less able to translate mathematical sentences and symbols, as well as write or represent the information provided.[3]

Numeracy literacy is part of mathematical literacy. Numeracy literacy is used as a substitute for national examinations in the independent curriculum.[4,5] Literacy is a person's competence in formulating, applying, and interpreting mathematical problems in various concepts using procedures and facts so as to understand the usefulness of mathematics in the real world.[6] While numeracy is a skill in understanding, interpreting numbers and symbols to solve everyday problems.[7,8] Thus, numeracy literacy ability is a person's ability to reason to understand, interpret, apply, and analyze a problem critically by involving symbols, language or mathematical models expressed in various forms of communication both orally and in writing.[2] In short, literacy is closely related to language, while numeracy is closely related to mathematics. So that numeracy literacy is an individual's ability to reason using language and mathematics.[9]

Numeracy literacy ability is very necessary in mathematics, because mathematics is not only always related to formulas, but also requires students' reasoning power or critical thinking patterns in answering every problem presented.[10,11] Numeracy literacy can also help students understand the role of mathematics in solving problems related to everyday life.[6] Numeracy literacy and story problems have coherence, which requires students to be skilled in reading, understanding, and analyzing mathematical problems.[12] Numeracy literacy questions are mostly in the form of story questions.[13] The indicators of numeracy literacy ability include using various kinds of numbers and symbols related to basic mathematics to solve problems in various contexts of daily life; analyzing information displayed in various forms (graphs, tables, charts, diagrams); and interpreting the results of the analysis to make decisions.[14]

Numeracy literacy ability can develop logical and systematic thinking in understanding, analyzing, and solving problems using mathematical knowledge if integrated in the learning process properly.[15] The three main keys needed in supporting the numeracy literacy process in learning in schools include obligations in carrying out numeracy literacy, providing platforms and opportunities for students, and getting support and providing solutions to problems related to numeracy literacy.[16]

Students' numeracy literacy ability are due to the large amount of material tested by TIMMS and PISA in the form of questions that are context problems in real life,[1] while students are not used to solving a real problem and are unable to analyze information in various forms.[2] Students are less able to translate mathematical sentences and symbols, as well as write or represent the information provided.[3,17] With the use of learning media, it can develop students' numeracy literacy ability. Yulianti[18] revealed that there is an influence of the application of appropriate and innovative learning models on students' numeracy literacy abilities. The use of learning videos in classroom learning is effective in terms of students' numeracy literacy and digital literacy ability.[19]

For this reason, the Government of Indonesia has launched the independent curriculum with a form of digitalization of education. One of them is digital facilities that can be used as learning resources, learning facilities and can access information that will help us improve the quality of learning. In the independent curriculum, teachers are given the freedom to compile lesson plans that suit their needs so that students interact more actively, dynamically, with learning models that are not rigid, more relevant and interactive. [20] Simplified, flexible, and competency-oriented curriculum. Teachers have the flexibility to conduct learning according to students' abilities and learning styles, contexts, local content, and students' multiple intelligences.

One of the peculiarities of the independent curriculum is the existence of differentiated learning. Differentiated learning is a teaching and learning process where students learn material based on their learning style and culture.[21] The learning views that students are different and dynamic.[22] Differentiated learning is learning that accommodates, serves, and recognizes student diversity in learning according to student

readiness, interests, and learning preferences.[23] The differentiated learning paradigm views all students as having their own uniqueness and having the best opportunity to learn.[24]

Teachers can design differentiated learning by paying attention to the components of content, processes, products, and learning environments tailored to readiness, interests, and learning profiles.[25] Each student has different abilities, personalities, learning strategies, attitudes, and motivations. These characteristics can affect the success rate of achieving student learning goals. Some common characteristics of students that need attention in the learning process include socioeconomic conditions, cultural factors, gender, growth, learning style, and learning ability.[26] Learning styles are how students select, acquire, process, and remember new information. Learning styles are characterized as certain attitudes and behaviors that help students during learning activities.[27]

Technological advances coupled with the Covid-19 pandemic have opened up opportunities in the application of differentiated learning in the form of online learning or e-learning. Through e-learning students learn comfortably by communicating with each other online.[28] In addition, e-learning has a multi-layer network that supports learning. E-learning opens opportunities for students to learn from various sources, so they can learn according to their respective characteristics to obtain more optimal learning outcomes. Learning materials can be presented in various forms, such as text, images, graphics, videos, or animations that can be chosen by students according to their wishes.[29,30] It can support differentiated learning where visual and auditory students will be facilitated by video, images, and animation. With the use of learning media, it can develop students' numeracy literacy ability.[6] Yulianti[18] revealed that there is an influence of the application of appropriate and innovative learning models on students' numeracy literacy ability. The use of learning videos in classroom learning is effective in terms of students' numeracy literacy and digital literacy ability.[11]

Haelermans[31] analyzes the effect of differentiated learning with the learning strategies of high school students. The results showed that student learning outcomes became better after participating in differentiated learning. Smets[23] found that teachers successfully implement various strategies related to differentiated learning. The results of previous studies have shown that the application of differentiated learning can improve learning activities and outcomes,[32] interest and motivation to learn, as well as providing opportunities for students to be able to learn efficiently.[33] Variacion[34] revealed that differentiated learning can improve student performance in the classroom. Sudiara[35] uses structured workheet in differentiated learning to improve mathematics learning outcomes of grade VII junior high school students on quadrilateral and triangular flat building materials. The results of Cindyana's[36] research show that there is an influence of differentiated learning assisted by RME-based geometry teaching materials on the mathematical reasoning ability of grade III elementary school students.

However, differentiated learning has not gone well. It is due to the lack of teacher knowledge and experience, availability of time and resources,[37] large class sizes, and lack of teaching materials that support differentiated learning.[38] Gaitas[39] found the difficulties of teachers in implementing differentiated learning, namely activities and materials, assessment, management, planning and preparation, and the classroom environment. Responding to the industrial era 4.0, it is time for teachers to utilize technology so that learning activities are more effective and efficient.[40]

Digital Learning Material (DLM) provides opportunities for students to do learning without being bound by time and distance by utilizing the internet. e-Learning provides opportunities to learn according to experience.[41,42] In addition, e-learning also opens opportunities for students to collaborate online to form online learning communities.[43] The use of digital learning materials through e-learning is expected to provide experience for students to be able to learn independently in the industrial era 4.0.[44] DLM offers a wide range of educational opportunities that cannot be achieved in face-to-face learning. DLM improves teaching efficiency and offers a more diverse learning experience without the constraints of time, space, and place.[45]

e-Module was designed with an innovative and interactive display so that it will attract students' attention. In addition to clear and systematic material discussion, the e-Module was equipped with audio and video features. In order to measure the level of student understanding, the e-module also contains exercises and evaluation questions that can be followed by students. e-Module has a high level of flexibility and effectiveness, because the material can be reviewed by students anytime and anywhere via handphone or computer.

e-Module can be a better learning resource compared to print modules usually because in them there is an element of collaborating multimedia technology. e-Module that will be designed also takes into account the learning style of students, namely visual, auditory, and kinesthetic. Learning that has been carried out using PBL e-module,[46] discovery learning,[47] android,[48] CTL,[49] guided inquiry,[50] constructivism and ethnomathematics.[51] However, these teaching materials have not paid attention to the learning style of students.

Therefore, electronic teaching materials are needed in the form of e-module that pay attention to student learning styles. This teaching material is named Adaptive e-Module (Ae-M). Through the use of Ae-M, it is expected to improve students' numeracy literacy ability. The purpose of this research is to produce a valid and practical Ae-M. After that, it will be revealed whether Ae-M is effective to improve students' numeracy literacy skills.

METHOD

Research Design

Type of research is development research with the Plomp model[52] which consists of three phases, namely preliminary research, development or prototyping phase, and assessment phase. In each phase there is an illustrated formative evaluation, such as figure 1.

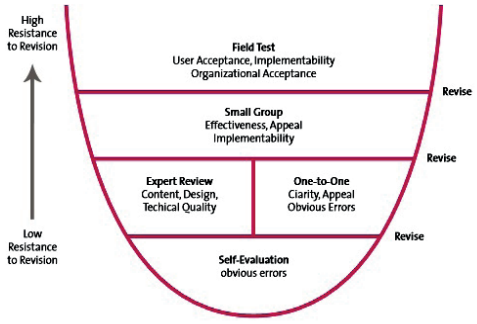


Figure 1. Layers of the formative evaluation of the Plomp model

Population and Sampling

This study involved 31 grade VII junior high school students. All students are 11–13 years old. They have different mathematical abilities.

Reseach Instruments

This study used a interview guidelines, observation sheets, checklists, questionnaires, and numeracy literacy ability tests. The questions were designed to allow students to use their numeracy literacy abilities.

Procedure

1. *Preliminary Research:* In this phase, identification of problems that occur in mathematics learning is carried out, so that it can be used as a reference in determining alternative solutions. Researchers obtained a provisional picture of the product specifications needed in the development of Ae-M. The analysis studies carried out include needs analysis, curriculum analysis, concept analysis, student analysis, and literature review.
2. *Development or Prototyping Phase:* In prototype 1, Ae-M was designed based on the results of the initial investigation phase, then continued with self-evaluation and expert review to determine the validity of Ae-M. Prototype 2 was obtained after revision based on the results of self-evaluation and expert review. The validated AE-M was tested on three students who had different abilities, namely high, medium, and low abilities. The selection of subjects of one to one evaluation is carried out by discussing with the mathematics teacher concerned. The purpose of the one to one evaluation activity is to find out students' responses and opinions about Ae-M readability, clarity of instructions, and other responses from students. The revised AE-M after a one-to-one evaluation is called Prototype 3. Small group evaluation activities are carried out by applying Ae-M to six students who are different from students in one to one evaluation. This activity aims to find out the practicality of Ae-M. The product that has been revised after a small group evaluation is called Prototype 4.
3. *Assessment Phase:* In this phase, an assessment of the quality of the products produced in the previous stage is carried out, especially the practicality and effectiveness of Ae-M. Data were obtained from questionnaires on the practicality of teacher and student responses, interviews with teachers, and numeracy literacy ability tests.

Data Analysis

The data analysis technique used is descriptive analysis to determine the level of validity, practicality, and effectiveness of Ae-M. Ae-M is said to be valid if the validity value is more than 2,40. Practicality test data were obtained from teacher and student response questionnaires. Ae-M is said to be practical when the practicality value is 75 % to 100 %. While the effectiveness test is obtained through numeracy literacy ability tests. Ae-M is said to be effective if students achieve numeracy literacy scores above 60 %.

RESULTS

Preliminary Research Results

Based on the results of the needs analysis, information was obtained that the teacher delivered the material in accordance with what was stated in the LKS and other supporting reference books through PowerPoint. Delfia

explained that students use LKS made without paying attention to the characteristics of students in the school. The use of books and PowerPoint has not fully involved students in the process of discovering mathematical concepts.[53] Learning tools commonly used by teachers are general[54] so that creativity,[55] problem-solving ability,[56] reasoning,[57] communication,[58] and students' critical thinking are still low.[59] Hakim[60] stated that the existing LKPD has not maximally helped students in understanding the material. It is because there are no step-by-step activities that can help students construct their own knowledge. Therefore, learning tools are needed that are designed according to student characteristics, involve technology, facilitate students in rediscovering mathematical concepts, and train numeracy literacy ability. Numeracy literacy test results in six schools can be seen in table 1.

Table 1. Numeracy literacy test results data based on school and learning style

Learning Style	N	Mean	Std. Deviation
Visual	61	14,79	5,598
Auditory	47	16,57	6,652
Kinesthetic	34	15,29	4,783
Total	142	15,50	5,809

This finding is supported by Khomariah's[61] opinion hich states that students who have a growth mindset and fixed mindset have differences in numeracy literacy ability. It is due to differences in students in facing challenges and difficulties in a problem. Improving the numeracy literacy ability of junior high school students needs to be done because most students still have difficulty in solving story problems. If students are familiar with story problems related to everyday life, these students will be able to improve their numeracy literacy ability. Rezky[62] founded that students only rewrote the information obtained from the problem, used the formula incorrectly, and did not provide relevant reasons for the answers presented.

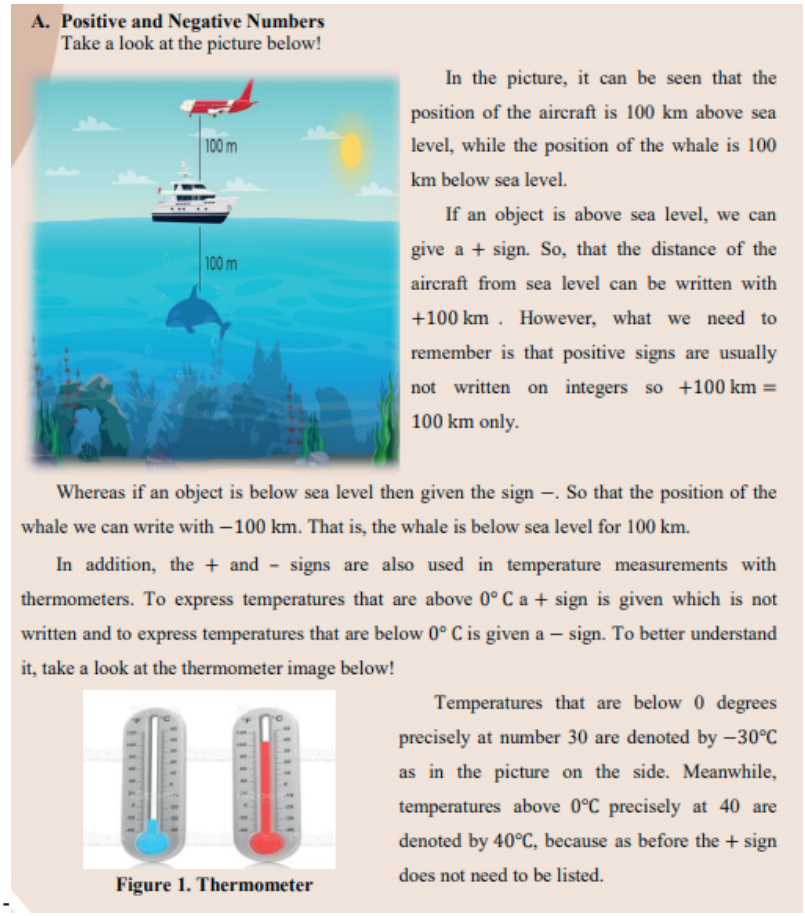
Current learning has not linked much with the real context to get a mathematics learning experience, so students have difficulty in translating narratives into mathematical models.[1] It is closely related to numeracy literacy ability. So it is necessary to design learning devices that can accommodate student characters to enhance their literacy ability. Hayati's findings[63] show that the mathematical literacy process of high school students has not been able to argue mathematically, even though they are good at calculating and using formulas. Students are less able to reason and plan problem solving, but are able to verbally express what is thought.

Development or Prototyping Phase Results

In this phase, Ae-M was developed based on the results of preliminary research. Here are some snippets from Ae-M.

Figure 2. Lesson material explanatory video

In Ae-M, an explanation of the material in the teaching materials is provided. Students who are not familiar with the material in Ae-M can repeat learning it through the videos. The use of learning videos in classroom learning is effective in terms of students' numeracy and digital literacy ability. These videos also facilitate students with visual and auditory learning styles.



A. Positive and Negative Numbers

Take a look at the picture below!

In the picture, it can be seen that the position of the aircraft is 100 km above sea level, while the position of the whale is 100 km below sea level.

If an object is above sea level, we can give a + sign. So, that the distance of the aircraft from sea level can be written with +100 km . However, what we need to remember is that positive signs are usually not written on integers so +100 km = 100 km only.

Whereas if an object is below sea level then given the sign −. So that the position of the whale we can write with −100 km. That is, the whale is below sea level for 100 km.

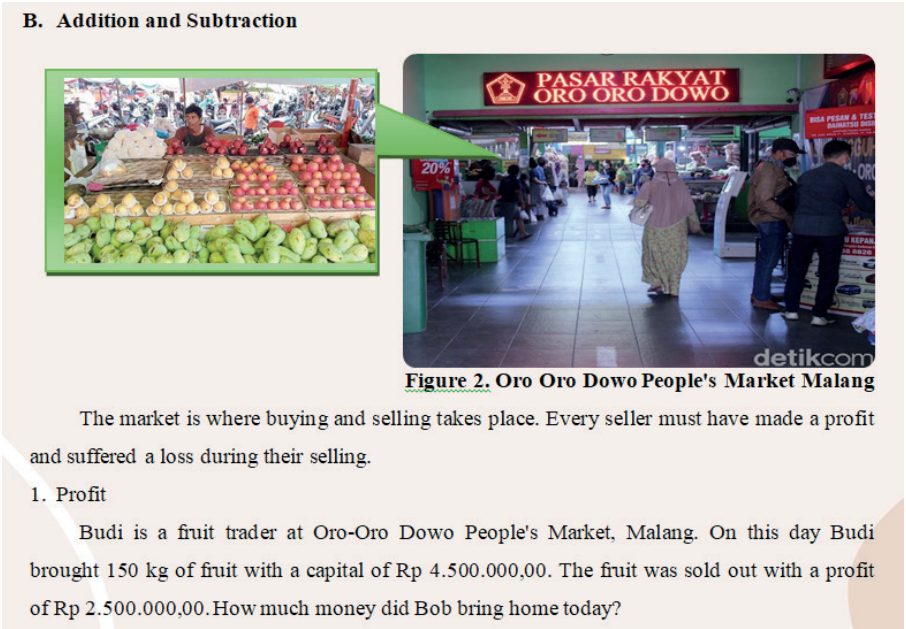
In addition, the + and – signs are also used in temperature measurements with thermometers. To express temperatures that are above 0° C a + sign is given which is not written and to express temperatures that are below 0° C is given a − sign. To better understand it, take a look at the thermometer image below!

Figure 1. Thermometer

Temperatures that are below 0 degrees precisely at number 30 are denoted by −30°C as in the picture on the side. Meanwhile, temperatures above 0°C precisely at 40 are denoted by 40°C, because as before the + sign does not need to be listed.

Figure 3. Presentation of integer material using the context of student life

By using the context in students' lives, they will more easily understand the material provided. For example, the context of positive and negative integers is illustrated by the position of the ship as the zero point. Ship-to-aircraft distance as a positive number and ship-to-fish distance as a negative number.



B. Addition and Subtraction

Figure 2. Oro Oro Dowo People's Market Malang

The market is where buying and selling takes place. Every seller must have made a profit and suffered a loss during their selling.

1. Profit

Budi is a fruit trader at Oro-Oro Dowo People's Market, Malang. On this day Budi brought 150 kg of fruit with a capital of Rp 4.500.000,00. The fruit was sold out with a profit of Rp 2.500.000,00. How much money did Bob bring home today?

Figure 4. Examples of contextual problems

The use of contextual examples will improve students' numeracy literacy ability. Students will be accustomed to solving problems that exist in their environment.

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Figure 5. Questions to improve students' numeracy literacy ability

Futhermore, students are given contextual exercises that support numeracy literacy ability. After Ae-M is produced, validation is carried out as table 2.

Table 2. Ae-M validation results by experts

No	Assessed Aspects	Avarage	Criteria
1	Content Aspect. The substance given is in accordance with the curriculum, logical and correct based on mathematical science	3,70	Very Valid
2	Language Aspect. Use correct language rules, such as the use of punctuation, coherence, and cohesiveness between paragraphs.	3,79	Very Valid
3	Didactic Aspect. Consistency of systematics of material presentation, examples, exercises, and feedback.	3,50	Very Valid
4	Graphic Aspect. Cover, fill, and cover layout, proportional font size and color.	3,60	Very Valid
	Average Validity	3,64	Very Valid

Based on table 2, it is known that the average validity of Ae-M for each aspect is very valid. One to one evaluation activities were carried out on three students who had different abilities. Students are welcome to read Ae-M and ask if there are sentences or instructions that are not understood. Student responses in the one to one evaluation stage are outlined in table 3.

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Table 3. Results of interviews with students at the one to one evaluation stage

No	Questions	Ability		
		High	Medium	Low
1	How do you think Ae-M looks?	Interesting, because there are instructions for using the Ae-M such as opening a textbook.	Interestingly, there are flip-flop videos and teaching materials.	Interesting, because it is colorful.
2	Is the font type and size on Ae-M easy to read?	Yes, the writing is legible.	Yes, the writing is legible.	Yes, the writing is legible.
3	Are sentences in Ae-M easy to understand?	Understandable.	Understandable.	Understandable.
4	Can you understand the instructions for using Ae-M?	Understandable.	Understandable.	Understandable.
5	What do you think of the presentation of material in Ae-M?	There are still materials that I don't understand such as data presentation materials.	I still can't understand the material well, but I try to repeat reading the module.	The material is easy to understand with explanations and examples of problems.
6	What do you think of the example questions and exercises in Ae-M?	Passable and an example of numeracy literacy questions.	Passable.	Passable.
7	Are you having any difficulties while using Ae-M?	A little confusion with the activities in the module, but helped by the instructions for use and how to use it.	Passable, because there is something new I know how to use google forms.	A bit confused because the google form link where it's a new thing for me, but because there is a way to use it I quite understand.
8	Do you think Ae-M can help you learn independently?	Yes, I can use this Ae-M independently.	Yes, I can use this Ae-M independently.	Yes, I can use this Ae-M independently.
9	Does learning to use Ae-M help you understand the material well?	Yes, because the material presented is clear and concise.	Yes, because the video makes it easier for me to understand the material.	Yes, I am easy to understand because there are explanatory videos and clear sample questions.
10	Do you think learning with Ae-M is easier and cheaper than printed modules?	Yes, I think Ae-M is easier and cheaper because I can open it on a cellphone, it's simple, and there is an explanation video.	Yes, in my opinion this Ae-M is easier and cheaper than the print one because it can be opened on a handphone and there is an explanation video.	Yes, I think Ae-M is easier and cheaper than the print one because it can be opened on a handphone and there is an explanation video.

Overall, high, medium, and low ability students can understand the Ae-M presented. It can be said that Ae-M can be said to be practical at the one to one evaluation stage. The next activity is small group evaluation. Students who take part in small group evaluation activities are different from students in the one to one evaluation stage even though they are still in the same class. During the small group evaluation activity, researchers are assisted by observers who are in charge of observing the implementation of learning using Ae-M. The results of the practicality questionnaire analysis can be seen in table 4 and table 5.

Table 4. Results of questionnaire analysis of practicality test by

No	Assessed Aspects	Average	Criteria
1	Usable.	3,60	Very Practical
2	Easy to use.	3,33	Practical
3	Appealing.	3,71	Very Practical
4	Cost effective.	3,50	Very Practical
	Average Practicality	3,52	Very Practical

Assessment Phase Results

Field tests were carried out as many as 5 meetings with the results of observations of its implementation as table 6.

Then a numeracy literacy ability test was carried out with the results as in table 7. From table 7 it can be said that Ae-M is effective in limited trials because students have achieved more than 60 % proficiency. So, valid, practical, and effective Ae-M has been obtained.

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Table 5. Results of questionnaire analysis of practicality test by students

No	Assessed Aspects	Average	Criteria
1	Usable.	3,63	Very Practical
2	Easy to use.	3,44	Practical
3	Appealing.	3,50	Very Practical
4	Cost effective.	3,54	Very Practical
	Average Practicality	3,51	Very Practical

Table 6. Results of learning implementation at the field test stage

Meeting	Score	Category
I	3,14	Good
II	3,14	Good
III	3,36	Good
IV	3,58	Good
V	3,86	Very Good
Average	3,42	Good

Table 7. Score details of each domain numeracy literacy ability

Numeracy Literacy Ability Domain	Percentage Indicator of Each Question (%)
Linear Equations	61,72
Comparison of Worth and Reverse Value	51,56
Integers	62,50
Geometry (Flat Building)	64,06
Using Data	65,63
Average	61,09

DISCUSSION

The use of digital teaching materials can create student-centered learning, making the learning process more innovative and fun because it displays material explanation videos, illustration images and case examples.[64] Digital teaching materials[65] and learning videos[66] can help schools implement independent learning by emphasizing student-centered learning. Student can learn and communicate with each other through digital teaching materials.[28] Digital teaching materials can be presented in the form of text, images, graphics, videos, or animations.[67] Digital teaching materials have a high level of flexibility and effectiveness, because the material can be reviewed by students anytime and anywhere through mobile phones or computers. Several researchers have previously discovered the potential of digital technology in differentiated learning.[68]

The differentiated learning paradigm views all students as having their own uniqueness.[69] Haelermans[31] analyzed the effect of differentiated learning with the learning strategies of secondary school students in the Netherlands. The results showed that student learning outcomes became better after participating in differentiated learning. Smets[23] found that teachers successfully implement various strategies related to differentiated learning. Previous research results have shown that the application of differentiated learning can improve student activities and learning outcomes,[32] interest and motivation to learn,[31] as well as providing opportunities for students to be able to learn naturally and efficiently.[70] Variacion[34] revealed that differentiated learning can improve student performance in the classroom. Sudiara[35] uses structured LKS in differentiated learning to improve mathematics learning outcomes of grade VII junior high school students on quadrilateral and triangular flat building materials. The results of Cindyana's research[36] show that there is an influence of differentiated learning assisted by RME-based geometry teaching materials on the mathematical reasoning ability of grade III elementary school students.

Learning conditions also affect concentration, application, and receipt of information.[71] When students have opportunities on an ongoing basis to think and talk about their best ways of learning, they become more aware of their strengths and needs.[21] Ae-M facilitates students with visual learning styles through images, students with auditory learning styles through learning videos, and students with kinesthetic learning styles through learning using computers. The use of e-Modules in the learning process will create student-centered learning, making the learning process more innovative and fun because it displays material explanation videos, illustration images

and case examples. e-Module was very effective for improving students' ability in understanding the material.[72]

With the help of Ae-M, students will gain a meaningful understanding in accordance with the demands of the independent curriculum in junior high school. The results of Widiantari's research[5] show that students' numeracy literacy ability has increased after using ethnomathematics-based e-Module. Sandy[73] developed a numeracy literacy e-Module for geometric transformation materials. The results of the student response questionnaire showed an average of 79 % so that the e-Module was practically used in learning. Yulianti[18] found the influence of the application of appropriate and innovative learning models on students' numeracy literacy ability. The use of learning videos in classroom learning is effective in terms of students' numeracy literacy and digital literacy ability.[11] Learning using Ae-M can support differentiated learning in order to improve students' numeracy literacy ability.

CONCLUSIONS

The conclusion of this study is that Ae-M has been produced which is able to facilitate students learning according to their learning style. The use of video is able to facilitate visual and auditory students in learning. With activities that use digital media, kinesthetic students can do learning according to their learning style. The use of Ae-M in learning can improve students' numeracy literacy ability. Ae-M is suitable for online and offline learning.

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CONFLICT OF INTEREST

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