



## **Multiplication and division of fractions based on numerical literacy electronic module for fifth grade elementary school students**

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**Abstract:** This research is motivated by the need to provide teaching materials in the form of electronic-based modules (e-modules) integrated with numeracy literacy learning. Where math books are less able to provide delivery related to numeracy literacy. Given the lack of a learning process during the covid 19 period to improve students' abilities in the field of numeracy. The research objective is to develop an e-module for multiplication and division of numeracy literacy fractions for grade 5 elementary school students for practical problem solving. The development research method with the ADDIE model is Analysis, Design, Developments, Implementation, and Evaluation. Analysis of the data used in the form of quantitative and qualitative data analysis techniques through expert validators of teaching materials, media and language as well as teacher and student response questionnaires. The results showed that the e-module of multiplication and division of fractions based on numeracy literacy was declared feasible or valid with an average score of 89.37%. The use of e-modules got a positive response from teachers and students based on a response questionnaire with an average score of 92%. This has an effect on increasing students' understanding in the material of multiplication and division of fractions with an average value of 88. So that the e-module of multiplication and division of fractions based on numeracy literacy can help students in learning mathematics in elementary schools.

**Kata Kunci:** e-module, fractional, numeracy literacy

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### **Introduction**

In Education, teachers must take advantage of technological advances in developing learning media in electronic teaching materials (Wulandari et al., 2018). Technology can effectively solve cognitively flexible problems in understanding numeracy literacy material, technology during the Covid-19 pandemic has a positive impact on education in accessing numeracy literacy materials (Xiao et al., 2019). Cognitive ability is related to pedagogical that focuses more on concepts and critical thinking in learning, one of which is utilizing technology (Alexander, 2018). Technology has a high correlation between motivation, self-regulation and self-regulation (Liou & Kuo, 2014). This electronic teaching material can be easier to convey and quickly obtain with information technology network devices (Chua & Dyson, 2004.; Kuncayono, 2018). Teachers can package learning modules with interest in the form of electronic modules (e-modules). The teacher systematically designs electronic modules with electronic formats in the form of links so that it is easily accessible from the beginning of the cover which is packed with dancing until the end by giving different colors in learning activities (Anandari et al., 2019).

Technology modules can stimulate students' interest due to sound effects, light, color fanfare, vivid animation, various narratives into innovative learning (Sung et al., 2019) and stimulate students' interest in learning, interactive students make students think critically (Sung et al., 2015). Packaging teaching materials in electronic form will make it easier for students to access learning materials. Learning will be achieved with the help of teachers to convey materials, knowledge, experience, and views about the learning to be learned. However, with the Covid-19 outbreak, teachers have difficulty conveying material and forcing themselves to use online media, this media can be used to access various



materials but can be understood by students and makes it easier for teachers to convey material to students who are not small and can be traveled long distances so that it can be done anywhere in the learning process (Syah, 2020).

The enactment of New Normal due to adaptation during the covid 19 pandemic gave rise to a new process of change in the habituation of remote teaching activities. The use of technology is a solution to facilitate the learning process, the use of technology is the first step that is applied in the distance learning process because nowadays everyone can access or use technology well so that there is no interference in its use, it just depends on a network connection (Andriani et al., 2019; Herwin et al., 2020; Saptono et al., 2021; Herwin et al., 2021). So, to convey the material requires teaching materials in the form of electronic modules, especially in mathematics subjects. Modules provide ease in understanding existing materials because they can learn them repeatedly in an exciting way can be accessed remotely, can be used by students and teachers and has a positive impact on creating innovation in online learning.

Researchers made observations with observations in grade 5 elementary school which showed students still had difficulties in understanding concepts so that students often memorized formulas, math books were less related to numeracy literacy. During the Covid-19 pandemic, the lack of concept delivery was due to teacher difficulties in delivering and explaining the material in the field of numeracy literacy, students were less interested in learning numeracy literacy because students still felt difficult in understanding numeracy literacy. So that appropriate learning is needed during a pandemic that can be accessed online but students are still able to understand the material and teachers are easy to explain in learning mathematics. The initial habituation which is usually learning can be done face-to-face, but now it must be changed to a learning model or learning activity that was much different before so that teachers are confused about what to do so that students with a large number of students can receive numeracy literacy material that runs conducive so that accepted by all students but the teacher still provides or conveys the material well so that it requires technology to reach all students to receive learning materials and an e-module learning media that has attractive packaging, does not saturate students learning especially students studying at home, can be done independently so as not to confuse parents with its use related to numeracy literacy, one of the mathematics subjects.

Mathematics is an essential basic science in everyday life; one of the mathematical materials is fractions. Fractions are the basis of mathematics where learners must master it (Wulandari et al., 2018; Hoyles, 2018) the purpose of mathematics involves students in revealing important information related to ways of thinking and reasoning (Cohrssen & Niklas, 2019). However, fractional material is often still difficult for students, and students only tend to memorize formulas. To make it easier for teachers to convey fractional material, teachers need interesting electronic modules, i.e., teachers can use numeracy literacy-based electronics modules. Numeracy literacy itself is a person's ability to solve problems in everyday life by using mathematical calculations practically unconsciously in everyday life students face problems related to numeracy literacy (Ekowati et al., 2019).

Numeracy literacy relating to grammar and numeracy by interrelatedness indicates the consistency of standard cognitive processes such as procedural, grammatical achievement and numeracy tasks (Mimeau et al., 2016). Numeracy literacy develops mathematical skills in calculating and understanding materials in numeracy and practical understanding of various mathematical concepts in solving problems (Sepulveda et al., 2020). In addition, numeracy literacy skills as early skills form the foundation, shape their skills, and as challenges in managing numeracy literacy activities (Lopez-Pedersen et al., 2020). The concept of numeracy literacy can conduct investigations in various disciplines has a vital role in understanding and interacting with students (Armstrong et al., 2018). Benefits of numeracy literacy students have meaningful experience related to mathematical concepts and know the development of mathematics cognitively and psychomotricity (Aunio et al., 2015). Learning using numeracy literacy-based e-modules can increase students' learning motivation, where e-modules can be used anytime and anywhere.

Therefore, researchers want to conduct further research on the development of e-modules multiplication and division of numeracy literacy-based fractions for fifth graders of elementary school. This research has also been conducted by Triwahyuningtyas et al. (2020). Learning using e-modules has a good impact and further enhances students' understanding of learning materials compared to printed teaching materials. In addition, it can motivate students in the future, utilizing the familiarity of students in the use of technology as an academic foundation of technology users and facilitating access in numeracy literacy learning (Stover et al., 2016). The advantages of e-modules have attractive packaging

that motivates students, are more flexible, interactive and can be accessed anywhere without the use of paper so as to improve students' understanding (Tang, 2021) and can improve students' literacy activities (Carol, 2018). Based on the research results, it can be concluded that the Development of numeracy literacy-based modules positively impacts student understanding. Use of these modules is worth using for the elementary school level learning process. On research Ekowati et al. (2019), numeracy literacy modules can provide habituation, Development in learning to students with innovation and modification at the time of learning. Combining mathematical knowledge with numeracy literacy has a good impact on developing students' thinking skills (Pangesti, 2018).

In addition, multimedia modules proved successful in teaching students to understand numeracy literacy concepts can be reached wherever students are, easy access in use so as to make students form independent attitudes in learning because in operation it makes it easier for students to understand material that feels difficult in the field of numeration literacy but with attractive packaging so that it motivates students to learn to explore the concept of numeracy literacy (Sayeski et al., 2015) but also with the use of technology students can solve problems skillfully in terms of numeracy literacy (Xiao et al., 2019). Use literacy-centered electronic modules by obtaining decent results in scientific contexts, content processes and attitudes (Irwansyah et al., 2017). Early numeracy implementation with the application of modules in collaboration can improve results and implement them (Hair et al., 2014) students' understanding of counting (Lopez-Pedersen et al., 2020). Based on this research, the importance of further research in the framework of innovation in mathematics modules based on numeracy literacy. The purpose of this study is to find out the feasibility, practicality and effectiveness of the e-module development of numeracy literacy-based fractionation and division for fifth graders of elementary school.

### **Methods**

This type of research is research and development. The type of research used in this research is research and development. (development), implementation (implementation) and evaluation (evaluation). The ADDIE research model is carried out in stages starting from analysis to systematic evaluation. Activities at the analysis stage are to analyze the material, teaching materials and characteristics of students in mathematics learning. Design is the activity of designing e-modules which is next in stage development developed e-module multiplication and fractional division based on numeracy literacy. In the Development, e-module validation will occur to determine the feasibility of the product using a validation sheet. Implementation of e-modules by testing-try to students in the field to find out the influence of e-modules on mathematics learning (Widyastuti & Susiana, 2019). Next, at the evaluation stage, improve the e-module based on validation results and field trials input. Evaluation activities are critical to improve and ensure the products are developed according to the design and materials that students need. (Aldoobie, 2015).

Data collection instruments in the form of questionnaires and research data collection using answers with a score scale. The score scale has criteria: score (4) is very good; (3) good; (2) good enough; (1) less good (Andriani et al., 2019). The data analysis techniques in this study are qualitative and quantitative analysis. This quantitative analysis uses the filling of questionnaires by validators and respondents that contain numeracy literacy-based e-modules on mathematical materials multiplication and division of fifth-grade fractions elementary school. The results of the analysis of data from validators serve to assess the feasibility of numeracy literacy-based e-modules. The qualitative analysis comes from criticism and validator advice from media experts, material experts, and linguists. Then also the response of teachers and students who are under the criteria contained in the e-module as a basis for revisions to numeracy literacy-based e-modules developed by researchers.

Packaging e-module based literacy of interesting, e-module framework consists of an e-module title, subject, topic or material, class, and author. There is a preface, table of contents, introduction consisting of core competencies, essential competencies, indicators, learning purposes, e-module instructions, a brief description of the material, and learning consists of (concept map, material description, summary, assignment/problem training). Then the evaluation consists of evaluation questions and a bibliography.

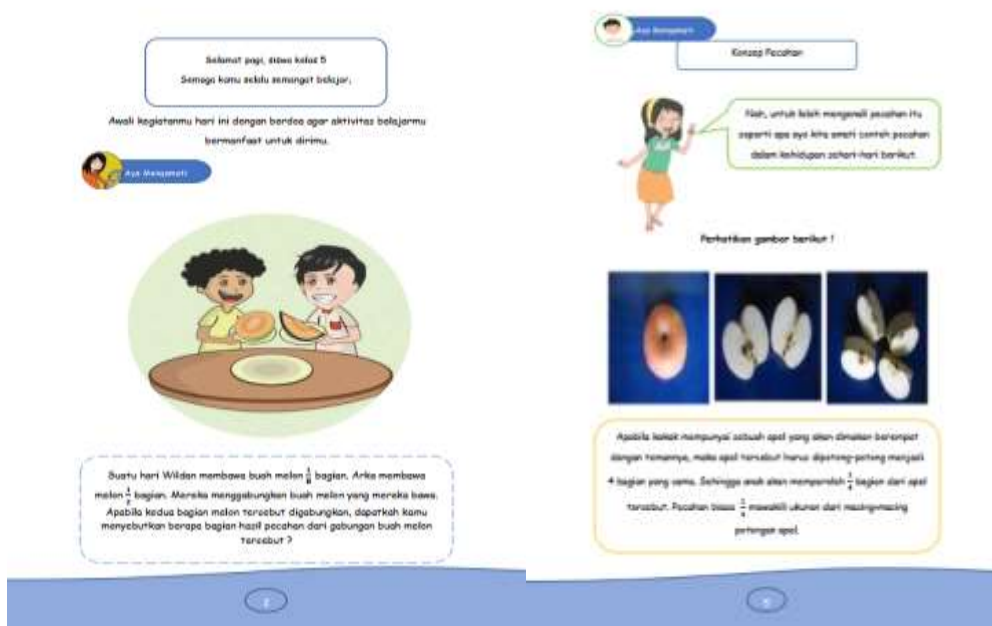
**Result and Discussion**

Development of e-module multiplication and division of numeracy literacy-based fractions for 5<sup>th</sup> grader using the ADDIE method through 5 stages (Pribadi, 2016). The stages are: 1) Analysis, researchers conduct observations and identify the activities of elementary students during online learning during the Covid-19 pandemic, 2) Design, researchers make e-module teaching material design such as initial design consisting of cover, title, preface, main competencies, essential competencies, indicators as well as for instructions for use and learning purposes (Safitri, 2017), 3) Development, The researcher realizes the design that he has made in the previous stage, 4) Implementation, the researcher analyzes the practicality test of teachers and a small group of 5th grades of elementary students as research subjects and 5) Evaluation, conducted with analysts. From the results of the student learning test. The following is the design of e-module numeracy literacy-based multiplication and division developed by researchers.

The design of this e-module is systematically arranged by presenting an interesting picture accompanied by material and questions related to phenomena in everyday life. Each picture has a description or context that is discussed in accordance with the steps of numeracy literacy starting from observing daily life to students doing practice questions in the form of evaluations to measure students' understanding of the material presented in the e-module.

**Context component**

The results of the development of e-module in terms of the context component are presented in Figure 1 below.



**Figure 1.** Observing fractions in daily life in the e-modul

Figure 1 describes in early learning activities observing or paying attention to images in everyday life, namely the division of fruit, means to increase students' learning interest in the learning process. In the module, the stage is observing related concepts in the context of everyday life through the images provided in the e-module. There are two different pictures of story questions related in everyday life that invite students to observe what is in the pictures and story questions. The first picture is presented with pictures of wildan and arka holding fruit as a form of conversation and presented with story questions related to everyday life with the aim of students observing and understanding what the story questions mean. In the second picture, students are invited to observe the image of the fruit that is broken down into fractions, one of the images related to the student's environment is exemplified by a picture of an apple accompanied by story questions for students to think critically about how to work in solving the story problems. After students observe the picture, students will be invited to enter into interesting

and challenging activities, students will think critically because they have started to introduce the concept of fractions aimed at improving students' abilities.

Content component

The results of the development of e-module in terms of the content component are presented in Figure 2 below.



Figure 2. Components of story questions to improve skills

Figure 2 describes in the e-module, some activities aim to improve the ability of fractional learning oriented to learners. Fill in the e-module after students observe pictures and numeracy literacy questions related to fractional forms. Furthermore, students are directed or invited to improve their competency skills by analyzing numeracy literacy problems with fractional material equipped with the presentation of pictures and questions. Then, students work on the problem according to the instructions that have been provided. Students try to work on understanding the material. After that, students work on questions in the form of a google form link, which is intended by students to make it easier to do and find out the cognitive abilities of students in understanding numeracy literacy problems in fractional forms. After students work on the practice questions, students proceed to the next stage, namely the stage of understanding the concept of fractions.

Process component

The results of the development of e-module in terms of the process component are presented in Figure 3 below.

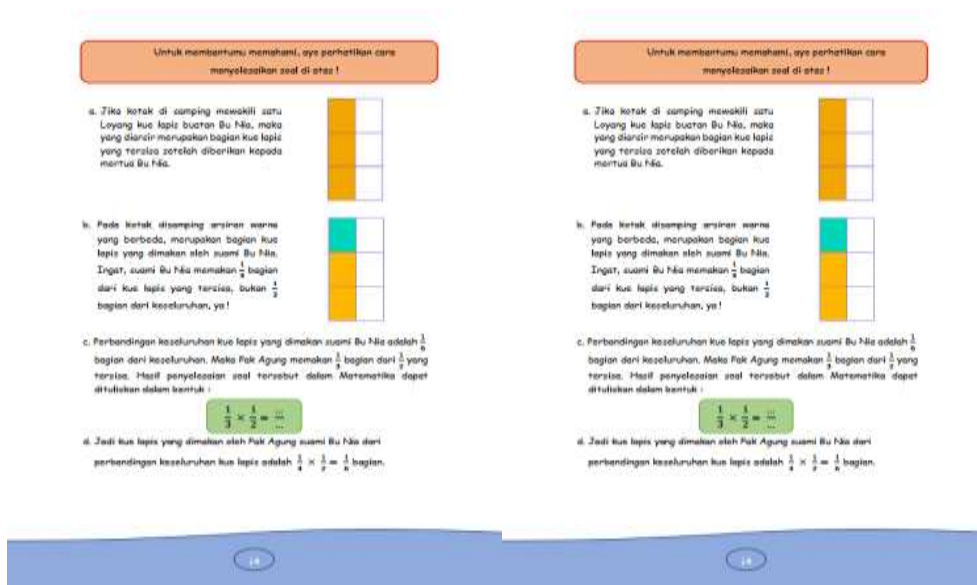


Figure 3. Problem understanding the concept of numeracy literacy

Figure 3 describes after doing the activity, there are activities to find concepts based on aspects that have been provided in learning, so students are expected to be able to solve problems. The contents of the e-module in understanding the mathematical concepts of fractions. This mathematical concept is directed in the form of numeracy literacy assisted by an image of a square shaded in the form of a fraction. The story questions are arranged sequentially and systematically to make it easier for students to understand the concept. The story problems are illustrated in the form of fractions and the completion of mathematical concepts along with how to solve them, both as a result of fractions and pictures. So that numeracy literacy skills in the form of fractions are conceptualized with interesting and challenging concepts starting from observing everyday life, story questions in the form of google form and the last stage, namely students understanding the whole concept both from story questions, fraction pictures and solving the problem. So that it grows students' cognitive competence in understanding fractional material.

The components in mathematical literacy, including content, process, and context (Johar, 2012). Content components are materials in mathematical studies that include change and relationships, number, form and space and uncertainty. Process components are methodologies used by a person to solve problems in certain circumstances by utilizing mathematical learning. A process component is a person's capacity to use, describe, and investigate events in solving a problem. The context component is a state that describes a problem that is framed covering the context in the surrounding environment ranging from the particular context to the social context in general.

Researchers conducted due diligence, practicality and effectiveness of e-modules based on numeracy literacy. This feasibility test is a validation stage of teaching materials. Validation aims to get assessments and suggestions from validators. During the practicality and effectiveness, the test is a stage of implementation.(Yunanda et al., 2018). Based on the feasibility assessment conducted by media expert validators, material experts and teaching materials experts displayed in Table 1.

Table 1. E-module validation results

Validator	Value obtained
Teaching materials expert	91.6%
Materials expert	83.2%
Media expert	92.3%
Average	89.0%

Based on these data, it can be known that the overall average of e-module validation assessment results reached 89% with the category "very feasible". Thus, the e-module can be used for grade 5<sup>th</sup> elementary school students with revisions that refer to comments and suggestions from validators. The

practicality of e-module multiplication and numeracy literacy-based fractional division for 5<sup>th</sup> graders has been completed trialled by Grade 5<sup>th</sup> students and teachers in elementary school. After trial, the practicality assessment questionnaire is given to 5<sup>th</sup>-grade students and teachers in elementary school with the following results.

**Table 2.** Assessment results of teacher and student response questionnaires

Respondents	Value
Teacher	91.7 %
Student	92.0 %
Average	91.3 %

Based on the data, it can be known that the overall average of e-module assessment results reached 91.35% with the category "very practical"(Safitri, 2017). Thus e-modules can be used in primary school with revisions that refer to comments and suggestions from classroom teachers. The effectiveness of e-modules multiplication and division of numeracy literacy-based fractions for grade 5 elementary school students, obtained from a score of 10 students who have worked on evaluation problems. The evaluation question was tested in the form of 10 multiple choice questions and five questions of description. The results obtained by researchers from problems worked by students have an average effectiveness score of 88%, which means "Very Effective". The results of the acquisition of grades obtained can show the results of the completion of learning carried out by students (Puyada et al., 2018). In addition, according to Einum (2020) students are motivated and serious in using e-modules by obtaining 83% with positive responses. The use of e-modules can make it more interactive and student engagement is higher (Zarzour et al., 2020).

Based on the results of the analysis of the quality criteria of e-module learning that has been met, the e-module multiplication and division of numeracy literacy-based fractions for grade 5 elementary school students has met three criteria of learning tests that have been conducted, namely feasibility tests, practicality tests, and effectiveness tests. Thus, e-modules multiplication and division of numeracy literacy-based fractions for grade 5 elementary school students can mentor learning activities.

### Conclusion

Based on the results of the development of modules, it was concluded that e-module multiplication and fractional division based on numeracy literacy was declared valid or feasible. That is obtained from validation results with an average value of 89%. Moreover, the product's practicality through the response questionnaire of teachers and students got an average score of 91.35%, which is categorized as very practical. As well as the effectiveness of products using tests, students get an average of 5<sup>th</sup>-grade results, which is 88% which falls into the effective category because it is above the minimum completeness criteria score of more than 70. The results of the acquisition of grades obtained can show the results of the completion of learning carried out by students.

It is expected that based on the results of the development of teaching materials in the form of electronic modules, e-module multiplication and fractional division based on numeracy literacy can be used for independent teaching materials to accompany students in math learning. In addition, it can also be used to motivate students' learning interests to add new insights and be used as a reference source for ongoing research. Subsequent research can continue further research in more detail and depth and provide innovations in packaging e-modules in other fields, especially mathematics which must update science to instill concepts that are easily conveyed by students and in their use so that they can be used as future research, generate new innovations and create motivation. to use the module and can be used as sustainability research.

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