Devoloping Digital Modules to Optimize Elementary School Students' Mathematical Proficiency

Purnomo Saputro[1] Wahyudin[2], and Tatang Herman[3]

[1,2,3] Universitas Pendidikan Indonesia, Indonesia
purnomo86@upi.edu

Abstract. 21st century learning encourages the use of information and communication technology in education, one of which is digital modules. The aim of this research is to develop digital modules to optimize the mathematical skills of elementary school students. This research method uses a 4-D model consisting of four stages, namely the define, design, develop and disseminate stages. The respondents of this study were a number of teachers and students of grade 5 elementary schools in Tasikmalaya City. Quantitative and qualitative data analysis techniques. The instruments used were e-module feasibility assessment questionnaires, teacher and principal response questionnaires, and cognitive test questions. The results of this study are digital modules that are useful, practical, easy, clear and feasible to improve students' math skills with successive percentages of 80%, 74%, 76%, 76%, and 76%. The digital module also has a good impact on mathematical skills obtained from the posttest results for school 1 of 61.5% and school 2 of 63.6%. The implication of this research is that it can be used as a reference for academic practitioners to develop e-modules on other materials and subjects.

Keywords: Digital Module, Mathematical Proficiency, Elementary School

1 Introduction

Technological developments during the era of the industrial revolution 4.0 went hand in hand with the progress of education in the world [1]. The use of technology in education has been around for a long time. The existence of technology in the learning process not only affects teachers and students, but also increases the value of the learning system itself [2]. Students' knowledge and skills in applying technology are not only useful in the learning process in the classroom, but also provide an important basis for solving problems in everyday life [3]. In line with the purpose of applying technology, learning mathematics has an important role in solving problems in everyday life.

Learning mathematics is not only able to solve mathematical problems but also teaches students to think logically, critically, and rationally so that students can compete and solve life's problems appropriately [4]. The rapid development of the times makes humans have to be flexible, as during the Covid 19 Pandemic. In early 2020 the

M. Salimi et al. (eds.), *Proceedings of the 6th International Conference on Learning Innovation and Quality Education (ICLIQE 2022)*, Advances in Social Science, Education and Humanities Research 767,
https://doi.org/10.2991/978-2-38476-114-2_118

spread of the Covid 19 virus was so massive. This is a challenge for educational institutions in carrying out the learning process. In line with the opinion [5] that education must run under any circumstances and run as usual.

The Ministry of Education and Culture The government has banned universities from carrying out face-to-face (conventional) learning and ordered them to hold lectures or online learning [5], [6]. The distance learning system (PJJ) is an effort to fulfill students' opportunities to get lifelong education, with the principles of independence, flexibility, suitability, up-to-date, and efficient [8]. These systems are seen as learning that can facilitate students during this pandemic. In addition, PJJ has a broad reach and provides opportunities (access) in learning [7].

The distance learning system implemented during the pandemic requires teachers to innovate in developing technology-based teaching materials that are widely accessible and can be easily accessed using PCs and laptops as well as mobile phones. Utilization of media in learning activities is a method to improve reciprocal communication between educators and students so that learning activities occur efficiently and effectively [8]. Creating an interesting and fun learning process can be done by utilizing technology as a teaching material to support the ongoing learning process [9].

In accordance with the increasingly rapid development of the times, teaching materials are not only in the form of books but can also be taken from the internet or other sources in the form of journal articles, electronic books (e-books), and electronic modules (e-modules), making it easier for students to to access various materials to be studied [10]. Digital modules are an option for digital-based learning designs that can be used during the COVID-19 pandemic 19 [11]. In line with that opinion, [12]also revealed that digital modules can be implemented as independent learning resources that can lead students to improve their competence or cognitive understanding and not depend anymore on the only source of information. Several previous studies have developed electronic modules as learning resources [13], [14].

The reality on the ground during the Covid-19 pandemic in elementary schools, in particular, there were no special learning tools that could support students' potential in improving mathematical skills. Students are only limited to carrying out online learning through the whatsapp application, as happened in class V of Kenconorejo 02 public elementary school [15]. The material is only limited to being photographed or students are immediately given assignments. Based on this description raises new problems for parents and students. Not all parents can provide an understanding of good mathematical skills to their children. [16] also revealed that the problems of mathematical skills that need attention are related to conventional learning systems which are often carried out in a fragmented manner. Fragmented, namely learning material that is taught separately, not linking one material to another or in another context.

Mathematical prowess is necessary as one of the conditions for achieving progress in this revolutionary era. Mathematical proficiency has components that cannot be separated, namely: (1) conceptual understanding, (2) procedural fluency, (3) strategic competence, (4) adaptive reasoning, and (5) productive disposition [16], [17]. The five components of mathematical prowess are a unit that is not separate but intertwined into one skill that represents different aspects of something complex. Mathematical communication is a person's skill in expressing their thoughts, and is responsible for

listening, interpreting, asking questions, and interpreting one idea with other ideas [18]. Therefore, everyone must be able to achieve mathematical prowess in order to become more competitive and not out of date [19]. The importance of mathematical skills has prompted several countries that want to progress to prioritize learning mathematics as the main lesson. Based on this explanation, it is necessary to develop teaching materials in the form of digital modules to support PJJ in optimizing mathematical skills. This research focuses on: 1. How is the development of digital module media to optimize math skills, and 2. How does digital module influence students' math skills.

2 Research Methods

The Research and Development model used in this study is in accordance with Thiagarajan's flow, namely 4-D (Four-D Models). Thiaga-rajan's development flow according to [20], [21], this development model consists of four stages, namely the define, design, develop and disseminate stages. 4D Model Learning Device Development Stage.

At the define stage, a needs analysis for the development of digital modules is carried out in the form of concept, student, and material analysis. At the design stage, digital module design is carried out. At the development stage, digital module development is carried out and digital module feasibility tests and students' mathematical abilities are carried out. At the disseminate stage, efforts are made to deploy digital modules.

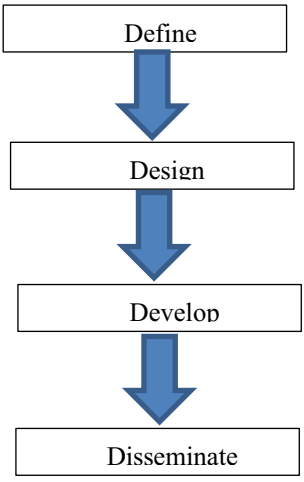


Fig. 1. Research Design

The subjects of this study were teachers and grade 5 elementary school students. This research was conducted in several schools in Tasikmalaya City. This research was

conducted in the range July - November 2022. Data collection techniques used interviews, questionnaires and tests. Meanwhile, the data collection tool uses interview guidelines, questionnaires and math proficiency tests.

Data analysis techniques were carried out quantitatively and qualitatively. Quantitative data analysis using descriptive statistics. The formula used to calculate the percentage is as follows [22].

$$\text{Percentage} = \frac{\sum(Answer\ X\ Weight\ of\ Each\ Choice)}{n\ x\ Highest\ Weight} \text{ x } 100\%$$

$\sum$= amount

n = the total number of questionnaire items

While the analysis of qualitative data with data reduction steps, data presentation, and conclusions.

3 Results and Discussion

3.1 Results

This study used a development model consisting of four stages, namely the define, design, develop, and disseminate stages.

a. Define

The digital module is the media used in class V mathematics lessons on fractional arithmetic operations. This digital module consists of several components including:

1) Page Covers
   The cover page contains the title of the digital module and the author who compiled the module.
2) Preface
   The preface is made to explain in outline and the purposes of the preparation of the module.
3) Table of Contents
   The table of contents is made to explain in detail about the contents of thr module.
4) Instructions for Using Digital Modules in Distance Learning
   The section explains how students use the module synchronously or asynchronously. This is adjusted to the availability of time that students have.
5) Daily Schedule Menu
   This menu displays the achievements that must be passed by students in this module.
6) Material Menu
   The menu material presented is material that has been prepared by taking into account aspects of students mathematical skills. The material is divided into three modules based on the results of the material analysis that has been validated by experts.
7) Question Exercise Menu

This practice questions menu is provided to drill questions and launch students' mathematical skills in the aspects of procedural fluency and students' strategic competence.

8) Learning Video Barcode Menu
   On the learning video barcode menu are learning videos that are shown or given in looking for references on youtube or videos that have been made by researchers during the preparation of this material.
9) Menu Motivational Words
   The motivational word menu is intended for students in arousing curiosity or motivating themselves to learn mathematics. This is done to fulfill one of the needs of the aspect of students' mathematical skills regarding productive dispositions.
10) Task Collection Menu
    This menu is a google drive sheet for students who carry out assignments by saving directly. Students can also send it directly to the WhatsApp group or send it directly to the teacher.

b. Design

At this design stage, the module arrangement is carried out. The following is the result of the Initial Module development.

Fig. 2. Initial Module Cover

The cover contains the material presented in the module. In the initial design, based on the results of the basic competence analysis for fifth grade elementary school mathematics during the pandemic, the material delivered to students could not be delivered in its entirety due to time constraints and the distance learning model. Finally, with consideration of time, the material presented in this module is only about hundredths fractions.

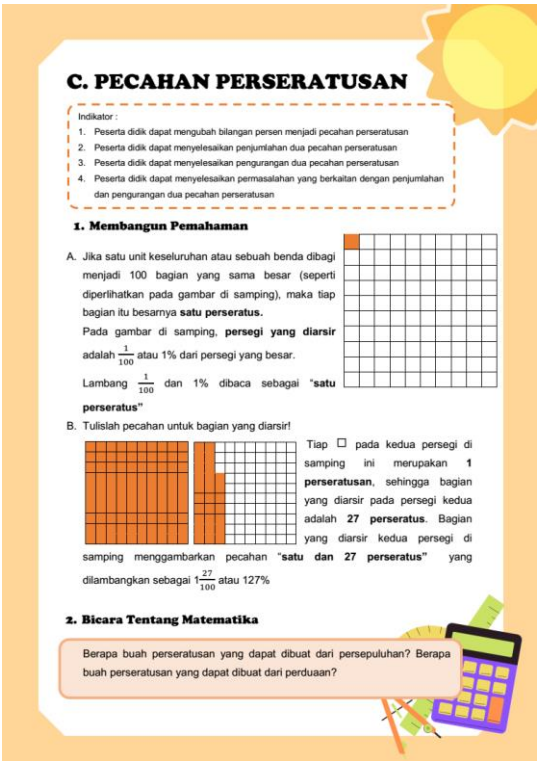


Fig. 3. Initial Section of the Initial Module

At the beginning of the module the researcher wrote down the indicators that would be conveyed to the students. The part that appears in this module after the indicators is part of building students' conceptual understanding. These concepts must be mastered by students as a part of mastering mathematical skills. At the beginning of planning the material presented was an understanding of the concept of the one hundredth course. In the module it is shown that the hundredths are using checkered paper which amounts to one hundred. And shaded one part box only. So that students understand the meaning of hundredths.

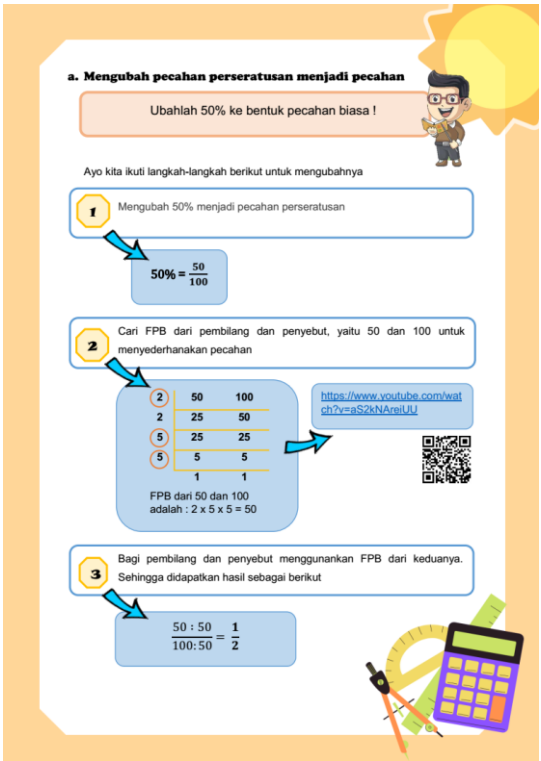


Fig. 4. Initial Module Contents Section

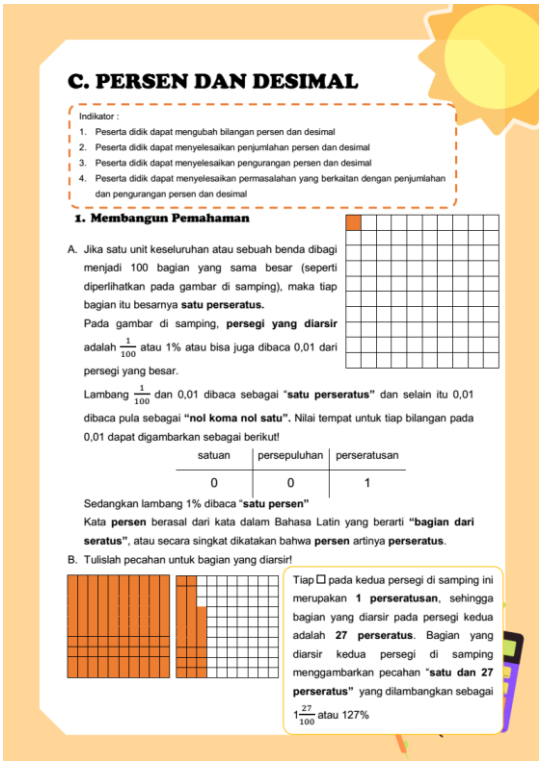
In the sub-material section, it is conveyed how students can learn about strategies for solving math problems. This is part of students' mathematical skills regarding strategic competence. This section also displays video links that students can watch as a means of explaining concepts that are conveyed in writing.

c. Develop

Based on the input of several practitioners and experts in learning media and mathematics materials. Researchers carry out module repairs, the following is an overview of the Revised Module.

Fig. 5. Revision Module Cover

Based on the results of the input given by the expert, this module is not allowed to omit decimal fraction material. Decimal fractions are material that must be given to fifth grade students and are an integral part of decimal fraction material. Therefore, the results of the revised cover added decimal fraction material.



C. PERSEN DAN DESIMAL

Indikator :

1. Peserta didik dapat mengubah bilangan persen dan desimal
2. Peserta didik dapat menyelesaikan penjumlahan persen dan desimal
3. Peserta didik dapat menyelesaikan pengurangan persen dan desimal
4. Peserta didik dapat menyelesaikan permasalahan yang berkaitan dengan penjumlahan dan pengurangan persen dan desimal

1. Membangun Pemahaman

A. Jika satu unit keseluruhan atau sebuah benda dibagi menjadi 100 bagian yang sama besar (seperti diperlihatkan pada gambar di samping), maka tiap bagian itu besarnya **satu perseratus.**

Pada gambar di samping, **persegi yang diarsir** adalah $\frac{1}{100}$ atau 1% atau bisa juga dibaca 0,01 dari persegi yang besar.

Lambang $\frac{1}{100}$ dan 0,01 dibaca sebagai "**satu perseratus**" dan selain itu 0,01 dibaca pula sebagai **"nol koma nol satu".** Nilai tempat untuk tiap bilangan pada 0,01 dapat digambarkan sebagai berikut!

satuan	persepuluhan	perseratusan
0	0	1

Sedangkan lambang 1% dibaca "**satu persen**"

Kata **persen** berasal dari kata dalam Bahasa Latin yang berarti **"bagian dari seratus"**, atau secara singkat dikatakan bahwa **persen** artinya **perseratus**.

B. Tulislah pecahan untuk bagian yang diarsir!

Tiap ☐ pada kedua persegi di samping ini merupakan **1 perseratusan**, sehingga bagian yang diarsir pada persegi kedua adalah **27 perseratus**. Bagian yang diarsir kedua persegi di samping menggambarkan pecahan "**satu dan 27 perseratus**" yang dilambangkan sebagai $1\frac{27}{100}$ atau 127%

Fig. 6. Initial Part of the Revision Module

Based on the revised results of the expert who wanted the material for decimal fractions to be discussed together with the material for hundredths fractions, the indicators section changed to adjust to the addition of indicators for decimal fractions. Apart from that, in the material which at first only discussed the concept of hundredths, after revision it was added to the material for decimal fractions. The understanding of the concept that is built seeks to be unified between hundredths fractions and decimal fractions.

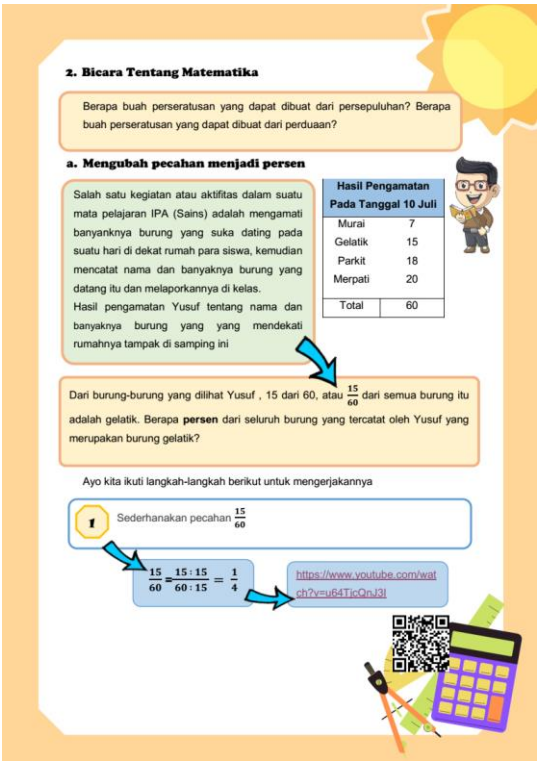


Fig. 7. Part of the Contents of the Revision Module

In this section, revisions are made to the sequence of material presented to students. On the recommendation of the expert team, the first material that must be submitted is how to change ordinary fractions into hundredths. So what was originally discussed about converting percent into fractions, based on the results of the revision, changed fractions to percent. This was done on the grounds that the order presented to students would form strategic competencies which students would later have to master.

The revised module is assessed by experts, namely lecturers and practitioners, namely teachers and school principals. The results of the assessment are presented in the following table.

Table 1. Digital Module Feasibility Assessment

No	Assessor	Useful-ness	Practicality	Ease	Clar-ity	Feasibil-ity
1	Practitioner 1	8	7	8	8	8
2	Practitioner 2	8	8	8	8	7
3	Practitioner 3	8	8	8	7	7
4	Practitioner 4	8	7	7	7	8
5	Expert	8	7	7	8	8
	Average	8	7,4	7,6	7,6	7,6
	Percentage	80%	74% 76%	76%	76%	

Digital modules have a very good impact on students' mathematical skills. The increase in students' mathematical skills is presented in the following table.

Tabel 2. Student Mathematical Proficiency

No	Pretest		Postest	
	Average	Complete-ness	Average	Complete-ness
School 1	22,3	0%	75,5	61,5%
School 2	28,3	0%	75,6	63,6 %

d. Disseminate

The disseminate stage was carried out in trials in a wider school. Other schools that were used as test sites were schools outside the City of Tasikmalaya. The schools chosen were the Gunungsari State Elementary School, Tasikmalaya Regency and the Abu Bakar Asshidiq Integrated Islamic Elementary School. The participants involved were teachers of grade V elementary schools. The form of dissemination that was carried out was the presentation of research results in pilot schools and the implementation of trials in these schools. The implementation of the module trial begins with preparing a lesson plan that is adapted to the school where the new trial is taking place. After the planning was completed, the pilot activities were carried out in class V. The responses obtained based on the trial results were obtained from teachers, principals and students as module users. The responses that occurred are presented in Table 3.

Tabel 3. Response of Teachers and Principals

Respondent	Response	Description
Teacher	The digital module works well for remote math learning. This can be seen from the enthusiasm of students. The level of attendance of students using synchronous and asynchronous models has increased.	Very good
Headmaster	The use of learning media is very necessary for the improvement of distance learning. Teachers who are already confused about distance learning are helped by this digital module. Moreover, all this time students feel afraid and think learning mathematics is difficult. Therefore, with this digital module it is hoped that it can bring up learning solutions.	Very good

3.2 Discussion

a. Digital Module

The digital module developed in this mathematics lesson is related to fractions. The module components include: instructions for use, daily schedule menu, material menu, question exercises menu, learning video barcode menu, motivational words menu, and assignment collection menu. The application of digital modules can help students to recognize and understand the concept of fractional arithmetic operations. In addition, this digital module can also assist students in mastering other mathematical skills such as procedural fluency, strategic competency, adaptive reasoning, and productive disposition. This is because this digital module is very easy to use. Evidenced by the results of the percentage of eligibility for digital modules (usefulness, practicality, convenience, clarity, and feasibility) successively with the percentages of 80%, 74%, 76%, 76%, and 76%.

The use of this digital module is very easy to use both with the help of the teacher when learning the synchronous model or students learning on their own using the asynchronous model. Students can easily follow the flow in the module, when they need a deeper explanation students can scan existing barcodes to enter YouTube and other videos that contain explanations of the material needed.

The development of the module as a learning resource carried out by [23] states that the application of the module makes students more interested in teaching and learning activities and students are also able to think creatively mathematically. The availability of modules in classroom learning can trigger students and educators to build enthusiasm for learning and teaching. Learning using modules can also maximize students' ability to solve problems creatively mathematically in everyday life. The results of research by [24] show that the flipbook maker-assisted math module is effective for increasing students' conceptual understanding skills in triangle material.

According to [25] more learning occurs without real reinforcement. In his research, it turns out that people can learn new responses by looking at the responses of others,

even learning continues without participating in what they have learned, and the models they observe also do not get reinforcement from their behavior. Learning through observation is much more efficient than learning through direct experience. Through observation, people can elicit countless responses, which can be followed by connection or reinforcement.

Modeling is at the core of observational learning. Mimicking or imitating should not be used to replace the word modeling because modeling requires more than just imitating or repeating what the person who is the model (others) does; modeling requires adding and or subtracting observed behavior, generalizing several observations at once, and involving cognitive processes. Simple reasoning processes can be developed through the observation process. Students can learn through a person's way of thinking in solving problems. The development of the reasoning process can be done by observing situations that can motivate students to actively observe the model ([26].

Models in this case can be teachers, colleagues, or teaching materials [25]. Presenting a model that attracts and motivates students can focus students on the observation process, such as the visualization displayed in the digital module. Listening to the teacher delivering material, peers expressing opinions in solving problems and observing problem solving schemes presented in teaching materials, helps students understand the learning behavior displayed during the learning process.

In this situation, cognitive factors play a role in observing, considering, and absorbing the learning behavior displayed by different models from the learning conditions in classes that learn with digital modules. In this class, students are faced with problems related to the concepts to be studied. Contextual problems are used to stimulate and attract students' attention so they can focus on the topic of the material being studied. The successful application of problem-based learning reported by [27]concludes that mathematical prowess can be developed through this model. Students' initial abilities are very important in the process of implementing this model, this is because students must be able to learn, and reason about the problems given at the beginning of learning.

b. Mathematical Proficiency

The results of the analysis in the table above explain the differences in the acquisition of students' mathematical skills before and after implementing the synchronous and synchronous model assisted by digital modules. Table 2 shows the differences in students' mathematical abilities before and after using this model. At the time of the school 1 and 2 pretest nothing was completed while when using the digital module the completeness level for school 1 was 61.5% and school 2 was 63.6%.

Improving students' mathematical skills can be done by training students to be able to understand concepts and convey ideas or ideas about a new concept or case. Students' mathematical skills must be continuously trained with various practice questions and support from the teacher to find the latest strategies based on the results of students' reasoning. When the teacher delivers material, or when students present their findings, other students can focus on listening and observing the process of conveying ideas carried out by the teacher or student. In situations, social cognitive theory explains that the learning process can occur simply through the process of observing. In social cognitive learning theory it is explained that the learning process occurs through interactions between behavioral, personal and situational factors [25], [28].

Mathematical skills are not just developing skills and understanding in students but the process of understanding, reasoning, using procedures, formulating, representing and solving problems the ability to think logically, reflect, explain and prove the truth, so that they have productive habits, see mathematics as a useful thing [29]. In research [16] there is a good potential effect on student learning outcomes that are usually given mathematical proficiency questions. In line with the results of research [30] that the TPS-type cooperative learning method can improve students' mathematical skills at Sinar Fajar Islamic Middle School. The same thing was also expressed by [31] that there were differences in the mathematical skills of students who received learning with the Open-Ended approach and conventional learning.

4 Conclusion

This development research has produced digital module products that are useful, practical, easy, clear and feasible to improve students' mathematical skills with successive percentages of 80%, 74%, 76%, 76%, and 76%. Digital modules have a good impact on mathematical skills. Based on the difference in pretest and posttest results, it was found that the mastery of school 1 increased by 61.5% and school 2 by 63.6%. Therefore, this digital learning module can be mass-produced for distribution to teachers who teach mathematics both in the school environment as a research site and in other elementary schools in mathematics.

References

1. S. Hendri, R. Handika, A. K. Kenedi, and D. Ramadhani, "Pengembangan Modul Digital Pembelajaran Matematika Berbasis Science, Technology, Enginiring, Mathematic untuk Calon Guru Sekolah Dasar," *J. Basicedu*, vol. 5, no. 4, pp. 2395–2403, 2021, [Online]. Available: https://jbasic.org/index.php/basicedu/article/view/1172
2. Abdurrahman, F. Ariyani, H. Maulina, and N. Nurulsari, "Design and validation of inquiry-based STEM learning strategy as a powerful alternative solution to facilitate gifted students facing 21st century challenging," *J. Educ. Gift. Young Sci.*, vol. 7, no. 1, pp. 33–56, 2019, doi: 10.17478/jegys.513308.
3. W. H. Al-Hilli, "Using software's and technology in solving mathematics problem to motivate and accelerate the learning process," *Eurasia J. Math. Sci. Technol. Educ.*, vol. 15, no. 3, pp. 1–6, 2019, doi: 10.29333/ejmste/102421102421.
4. H. Wilujeng and Novitasari, "Analisis Kemampuan Pemecahan Masalah Matematika Science Study (TIMSS)," *Prima J. Pendidik. Mat.*, vol. 2, no. 2, pp. 137–147, 2018.
5. K. Kesehatan, *Pedoman Pencegahan dan Pengendalian Coronavirus Disease (COVID-19)*. 2020.
6. N. A. Nabila, "Pembelajaran Daring di Era Covid-19," *J. Pendidik.*, vol. 01, no. 01, pp. 1–10, 2020, [Online]. Available: https://psyarxiv.com/an4vq/download
7. M. P. Rustiono, "Peran Pustakawan Pendidikan Jarak Jauh Di Era Disrupsi: Studi Kasus Di Perpustakaan Universitas Terbuka," *J. Pustak. Indones.*, vol. 17, no. 2, pp. 64–70, 2018.

8. F. S. Munjariyati, Haryadi, and R. Pristiwati, “Implementasi Media Audiovisual Powtoon Dalam Pembelajaran Puisi Secara Daring Kelas X Semester 2 Tahun Pelajaran 2020/2021 Sma Negeri 2 Cikarang Selatan,” *Asas J. Sastra*, vol. 11, no. 1, pp. 144–156, 2022.
9. M. Muammar and S. Suhartina, “Media Pembelajaran Berbasis Teknologi Informasi dalam Meningkatkan Minat Belajar Akidah Akhlak,” *KURIOSITAS Media Komun. Sos. dan Keagamaan*, vol. 11, no. 2, pp. 176–188, 2018, doi: 10.35905/kur.v11i2.728.
10. K. R. Winatha, “Pengembangan E-modul Interaktif Berbasis Proyek Mata Pelajaran Simulasi Digital,” *J. Pendidik. Teknol. dan Kejuru.*, vol. 15, no. 2, pp. 188–199, 2018, doi: 10.23887/jptk-undiksha.v15i2.14021.
11. I. Kartiko and H. L. Mampouw, “Pengembangan E-Modul Berbasis Aplikasi Android pada Materi Perbandingan Berbalik Nilai,” *J. Cendekia J. Pendidik. Mat.*, vol. 5, no. 2, pp. 1700–1710, 2021, doi: 10.31004/cendekia.v5i2.695.
12. R. Florentina Turnip and H. Karyono, “Pengembangan E-modul Matematika Dalam Meningkatkan Keterampilan Berpikir Kritis,” *J. Edukasi Mat. dan Sains)*, vol. 9, no. 2, pp. 485–498, 2021, doi: 10.25273/jems.v9i2.11057.
13. L. Pilt, T. Tartes, and T. Marandi, “Tool for creating learning modules developed on the basis of open source OpenScholar software,” 2007, [Online]. Available: https://dspacecris.eurocris.org/handle/11366/484
14. F. Ferdianto, Setiyani, and D. Nurulfatwa, “3D page flip professional: Enhance of representation mathematical ability on linear equation in one variable,” *J. Phys. Conf. Ser.*, vol. 1188, no. 1, 2019, doi: 10.1088/1742-6596/1188/1/012043.
15. I. Irmawati and H. U. Kaltsum, “Sarana dan Prasarana Pembelajaran Daring pada Masa Pandemi Covid-19 di Sekolah Dasar,” *J. Basicedu*, vol. 6, no. 3, pp. 3918–3930, 2022, doi: 10.31004/basicedu.v6i3.1629.
16. E. Khaerunnisa and A. S. Pamungkas, “Pengembangan Instrumen Kecakapan Matematis Dalam Konteks Kearifan Lokal Budaya Banten Pada Materi Bangun Ruang Sisi Datar,” *Kreano J. Mat. Kreat.*, vol. 9, no. 1, pp. 17–27, 2018, doi: 10.15294/kreano.v9i1.11210.
17. B. Kilpatrick, J., Swafford, J., & Findell, *Adding It Up: Helping Children Learn Mathematics*. Washington, DC: National Academy Press., 2001.
18. R. Wulan Fitriana and A. Prabowo, “The analysis of student’s mathematical communication ability viewed from learning styles through project based learning models on cylinder and cone materials A R T I C L E I N F O,” *Unnes J. Math. Educ.*, vol. 7, no. 3, pp. 156–163, 2018, doi: 10.15294/ujme.v7i1.22165.
19. A. Hendrayana, “Pengaruh pembelajaran pendekatan rigorous mathematical thinking (RMT) terhadap pemahaman konseptual matematis siswa SMP,” *J. Ris. Pendidik. Mat.*, vol. 4, no. 2, p. 186, 2017, doi: 10.21831/jrpm.v4i2.15385.
20. Trianto, *Desain Pengembangan Pembelajaran Tematik*. Jakarta: Kencana, 2011.
21. K. Yuliani and S. Suragih, “The Development of Learning Devices Based Guided Discovery Model to Imrprove Understanding Concept and Critical Thinking Mathematically Ability of Students at Islamic Junor High School of Medan,” *J. Educ. Pract.*, vol. 6, no. 24, pp. 116–128, 2015, [Online]. Available: http://search.proquest.com/docview/1773215035?accountid=8330
22. Sarmadan, “Pengembangan Bahan Ajar Menulis Karya Ilmiah Dalam Pengajaran Bahasa Indonesia Di Stikom Kota Jambi,” *J. Ilm. Univ. Batanghari Jambi*, vol. 17, no. 1, pp. 159–171, 2017.
23. D. Ariskasari and D. D. Pratiwi, “Pengembangan Modul Matematika Berbasis Problem Solving pada Materi Vektor,” *Desimal J. Mat.*, vol. 2, no. 3, pp. 249–258, 2019, doi: 10.24042/djm.v2i3.4454.

24. F. Haryanti and B. A. Saputro, "Pengembangan Modul Matematika Berbasis Discovery Learning Berbantuan Flipbook Maker Untuk Meningkatkan Kemampuan Pemahaman Konsep Siswa Pada Materi Segitiga," *KALAMATIKA J. Pendidik. Mat.*, vol. 1, no. 2, p. 147, 2016, doi: 10.22236/kalamatika.vol1no2.2016pp147-161.
25. R. G. Bautista, "The students' procedural fluency and written-mathematical explanation on constructed response tasks in physics," *J. Technol. Sci. Educ.*, vol. 3, no. 1, pp. 49–56, 2013, doi: 10.3926/jotse.68.
26. A. Susilo and S. U.S., "Penerapan Model Pembelajaran Team Assisted Individualization Berbantuan Lembar Kerja Siswa dalam Upaya Meningkatkan Kualitas Proses dan Hasil Belajar Matematika Siswa MTs," *Form. J. Ilm. Pendidik. MIPA*, vol. 1, no. 3, pp. 192–207, 2015, doi: 10.30998/formatif.v1i3.78.
27. I. Laili, Ganefri, and Usmeldi, "Efektivitas pengembangan e-modul project based learning pada mata pelajaran instalasi motor listrik," *J. Imiah Pendidik. dan Pembelajaran*, vol. 3, no. 3, pp. 306–315, 2019, [Online]. Available: https://ejournal.undiksha.ac.id/index.php/JIPP/article/download/21840/13513
28. A. Bandura and R. H. Walters, *Social learning theory*, vol. 1. Englewood cliffs Prentice Hall, 1977.
29. M. Hutajulu, E. Senjayawati, and E. D. Minarti, "Analisis Kesalahan Siswa SMK Dalam Menyelesaikan Soal Kecakapan Matematis Pada Materi Bangun Ruang," *Mosharafa J. Pendidik. Mat.*, vol. 8, no. 3, pp. 365–376, 2019, doi: 10.31980/mosharafa.v8i3.505.
30. F. Roziaturizkoh, "Jurnal Utile Penerapan Model Pembelajaran Kooperatif Tipe Think-Pair-Share Untuk Meningkatkan Kecakapan Matematis Siswa Matematika memiliki peran yang kehidupan , karena banyak sekali pendidikan karena tanpa adanya Mengingat pentingnya tujuan pembelajaran," *utile J. Kependidikan*, vol. VI, no. I, pp. 100–103, 2020.
31. B. P. Irawan, "Kecakapan Matematis (Mathematical Proficiency) Siswa dalam Pembelajaran Open-Ended di Sekolah Menengah Pertama," *J. Perspekt. Pendidik.*, vol. 12, no. 1, pp. 60–71, 2018, [Online]. Available: http://ojs.stkippgri-lubuklinggau.ac.id/index.php/JPP60