

THE DEVELOPMENT OF E – MATHEMATICS MODULES AS ALTERNATIVE TEACHING MATERIALS FOR STUDENTS ON MATERIAL OF SET AT SMP MUHAMMADIYAH 8 MEDAN

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Article History

Received: 4

Revised:

Accepted:

Published:

Keywords

e-mathematics modules,
teaching materials, sets

ABSTRACT

This type of research uses Research and Development (R&D). This development research was conducted to produce a product and determine the validity and student responses to the E-module as an alternative student teaching material that has been produced. This product was developed using the ADDIE model which was modified into 3 stages, such as analysis, design, and development. This study developed the E – Mathematics module as alternative teaching material for students on set material at SMP Muhammadiyah 8 Medan. The subjects of this study were students of class VII which consisted of 10 students, where the researcher selected respondents based on a small scale. The E-module that has been created met the criteria of validity shown by using the validation sheet of media experts and material experts. The results of the media expert's validation reached an average score of 3.06 with the criteria, and the material expert's validation reached an average score of 3.15 with valid criteria. The attractiveness aspect based on student responses got an average score of 3.43 in the interesting category. Based on the results of research and discussions that have been carried out, it can be said that the e-mathematics module as alternative teaching material on set material is eligible and interesting to use in terms of aspects of validity and student responses.

1. INTRODUCTION

The advance in science and technology is growing rapidly due to the digitalization era, especially in the field of education. According to (Safitri, 2017) it is hoped that education can create competent individuals in their fields, which can then be in line with developing science and technology. In the world of education, mathematics is one of the fields that play an important role. If it is viewed from the schedule, this mathematics lesson has the most hours compared to other subjects. Mathematics is taught in education ranging from elementary school to college.

Mathematics as a universal science forms the basis of modern developed technology along with a very crucial role in various sciences and puts forward the power of human thought. The developed science and technology are based on the development of mathematics in the fields of number theory, algebra, analysis, probability theory, and mathematics (Meidawati, 2014). This shows that mathematics is an important science that must be learned and mastered by all individuals because it can be useful in life today and in the future. According to Habibi, (2017) some students think that learning mathematics is very difficult because mathematics contains formulas and calculations for solving problems, and is also a boring subject.

Mathematics has characteristics of interrelated concepts which means that to understand new concepts, students must understand previous concepts that are directly or indirectly related to what will be studied. Students still complain a lot about mathematics. They think that mathematics is a difficult and scary subject.

There are several factors that influence students' thinking that mathematics is difficult to understand and complicated because mathematics is related to formulas and calculations. Sometimes, the teacher does not convey the material properly and correctly so students do not understand the material given. With some of these complaints, students become lazy to respond to the teacher when asking questions and students pay less attention to the teacher when explaining.

When learning takes place, the mathematics module often makes students bored in learning mathematics because there is no alternative assistance through media in interactive learning which then adds to the enthusiasm of students in learning. In this case, the use of technology in teaching materials makes it easier to convey the material being taught as interesting. This teaching material is useful in the reference for delivering material by teachers (Ningtyas et al., 2019).

According to (Wibowo, 2018) science and technology are growing rapidly, and are still to be updated leading to exciting learning which is not difficult anymore. Producing interesting and fun learning methods is to support the learning process. In line with the progress of the times, teaching materials are not only in the form of books but can also be obtained from the internet or from other sources in the form of journals, articles, electronic books (e-books), and electronic materials (e-modules), which are useful for students in accessing material.

According to (Ningtyas et al., 2019) teaching materials can be implemented in all subjects, especially mathematics which is assumed as complicated and difficult to understand but can be packaged in electronic-based teaching materials to increase student interest in learning. In reducing the boredom level of students in learning by using print modules, it can be combined with electronic media, known as electronic modules or E-Modules. According to Kadek Aris Priyanthi & Ketut Agustini, (2017) an electronic-based module (e-module) is a form of data in the form of a book that is displayed electronically using a hard disk, diskette, CD, or flash disk and can be read using a PC or novel reader electronic equipment. E-modules are very good to use to increase the participation of teaching participants in learning methods.

According to Romayanti et al. (2020), the use of teaching materials in the form of e-modules is used as a substitute for books or printed materials (hardcopy) without reducing the function as a source of information. The use of e-modules can be used in the classroom or outside the classroom. E-modules make the learning process easier to make because they can be inserted with pictures or learning videos in them. This can help students in mastering teaching materials because there are study instructions and descriptions of the design in a coherent way. The existence of this electronic material makes students enthusiastic and motivated so that learning is not monotonous.

One of the software that can be used in making this e-module is Canva. Canva is an application that can support the development of e-modules as a learning medium that is quite interesting and easy to implement so that learning is not monotonous. In this application, it does not only display writing but there are interesting features such as motion animation, video, audio, and images so that the presentation of the material is richer and more interesting during the learning process. Using this application can make it easier for teachers to deliver material

and make students more active.

Therefore, in this era of technological advancement, it is hoped that teachers will not only be able to teach students, but also organize data and improve learning media to provide students with practicing activities. Learning media innovation is deemed necessary to be raised to support the learning process. Practicing strategies and using good learning media are expected to improve student learning outcomes.

2. METHODOLOGY

This research was conducted at SMP Muhammadiyah 8 Medan which is located on Main Street No. 170, RT.02, Kec. Medan Area, Medan City, North Sumatra. The research was carried out in the odd semester in class VII SMP Muhammadiyah 8 Academic Year 2021/2022.

In this study, the researchers used research and development methods. Research and Development is a research method used to produce certain products, and test their effectiveness of these products (Sugiyono, 2013). However, the researcher used the ADDIE model which has been modified into three stages, which were analysis, design, and development. A needs analysis was used to test the validation of the product before it could be used by society. In this study, multi-material teaching materials were developed such as e-modules. The research intends to develop teaching materials in the form of e-modules.

3. RESULTS AND DISCUSSION

This development research produces a learning media product based on the e-mathematics module as alternative teaching material for students with set material which is carried out at SMP Muhammadiyah 8 Medan. As for the model selection, the researcher used the ADDIE model which has been modified into three stages, which were analysis, design, and development. The following is the presentation of the results of each stage:

Analysis Stage

Problem Analysis

This research and development were seen from the problems found in class VII students at SMP Muhammadiyah 8 Medan, therefore based on the analysis obtained by the researchers, students felt easily bored and were less interested in learning mathematics when teachers used learning media that did not vary such as a printed book. In addition, the researchers found problems such as some students who lost the module, complained about the damage to the module, and often forgot to bring the module. Another complaint was that the learning media used by students was less attractive. This causes disruption of the learning process therefore the classroom atmosphere is not conducive.

Analysis of Student's Needs

This research and development is seen from the problems found in class VII students at SMP Muhammadiyah 8 Medan, therefore based on the analysis of the researchers obtained, students need a learning media that can attract students to be more interested in learning mathematics and is not monotonous and can be adjusted. It also can be used easily and is not limited to time and space. The researcher also saw that students were more interested in using their cellphones than reading and studying the modules they had. From the analysis above, the researcher concluded that the E-module as an alternative student teaching material could help students overcome the problems that have occurred so far, and of course, students would need them in the future.

Design Stage

Based on the results of the analysis, the next stage was the design stage. The stages carried out were as follows:

Content Design

The components contained in the module include an introduction, table of contents, concept map, core competencies and basic competencies, achievement indicators, materials, exercises, evaluations, videos, and bibliography.

Material Design

The material used by the researcher is set material taken from several reference sources such as class VII textbooks and the internet. The set material presented includes a definition of sets, notation of sets & members of sets, declaring & determining sets, empty sets & universal sets, the cardinality of sets, finite & infinite sets, union of two sets, Venn diagrams, intersections of sets, union of sets, application of sets in life.

Development Stage

E-module Creation

After the design stage, the next stage was the stage of making e-modules that were adapted to the following components:

E-module Cover



Figure 4.1

Introduction



Figure 4.2

Table of Content



DAFTAR ISI

Pendahuluan
 Peta Konsep
 Kompetensi Dasar
 Kompetensi Inti
 Indikator
 HimPunan
 A. Defenisi HimPunan
 B. Notasi HimPunan & Anggota HimPunan
 C. Menyatakan & Menentukan HimPunan
 D. HimPunan Kosong & HimPunan Semesta
 E. Kardinalitas HimPunan
 F. HimPunan Berhingga & Tak Berhingga
 G. Gabungan Antar HimPunan
 H. Diagram Venn
 I. Irisan HimPunan
 J. Gabungan HimPunan
 K. APLIKASI HimPunan dalam Kehidupan

Figure 4.3

Concept maps



Figure 4.4

Core Competencies and Basic Competencies

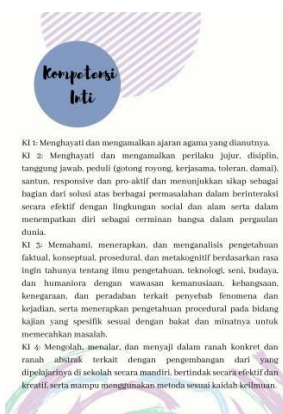


Figure 4.5



Gambar 4.6

Material



Figure 4.7

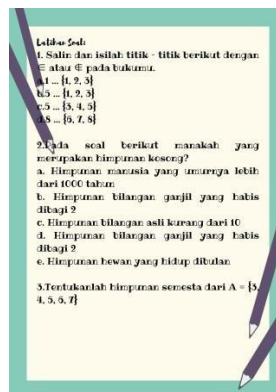


Figure 4.8

Exercise

Competency Test



Figure 4.9

Video



Figure 4.10

Bibliography

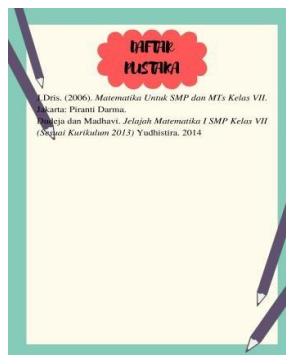


Figure 4.11

Discussion

Research and development on products in the form of e-mathematics modules as alternative teaching materials for students on set material at SMP Muhammadiyah 8 Medan using the ADDIE model was modified into three stages, such as analysis, design, and development.

Analysis

The analysis carried out in this study initially was to analyze the problem where the researcher saw that there were some students who lost the module, complained about the damage to the module, often forgot to bring the module, and the learning media used was less attractive and resulted in the students feel bored and less enthusiastic during the learning process. Moreover, researchers also found that there were some students who were busy playing with their cellphones instead of reading or working on the modules they had. This causes disruption of the learning process which leads to not being conducive. Teachers attempt to find solutions by analyzing the needs of students. Researchers found that students need learning media that can attract students to be more interested in learning mathematics and are not monotonous and are adapted to technological developments. For this reason, researchers develop learning media that are adapted to technological developments, such as E-mathematics modules as alternative teaching materials for students,

where the material that researchers used was material about sets. The material used was adjusted to the curriculum in the school and the content of the module material was adjusted to the content of the module material used by teachers including the main material and sub-sections of the subject matter contained in the set.

Design

At this stage, the first thing to do was the selection of media and learning materials as well as an adapted design. The media used was the e-mathematical module learning media as alternative teaching materials to attract students to learning because there were learning materials and videos. In addition, users only used smartphones to make it easier for students because they did not need additional devices or software to access them and were not bound by space and time.

Development

Media Experts Validation

Based on the results of table 4.1 above show that the media expert validator provides an assessment with an average score of 3.06 with the "Valid" criteria, so it can be concluded that the teaching materials used were valid and not revised so that they could be applied in class.

Material Expert Validation

Based on the results of table 4.2 above show that the material expert validator provides an assessment with an average score of 3.15 with the "Valid" criteria, so it could be concluded that the teaching materials used were valid and not revised.

Teachers Validation

Based on the results of table 4.3 above show that the validator by the teacher provides an assessment with an average score of 3.69 with the "Very Valid" criteria, so it could be concluded that the teaching materials used were valid and not revised.

Student Responses

Based on table 4.6 above, a small-scale trial was carried out with 10 students selected. In this trial, students were distributed e-modules in the form of links to WhatsApp groups which were carried out by simply clicking on the link, but because circumstances did not allow students to bring smartphones to school then the researcher displays the e-module with a projector.

After that, students were given a questionnaire to assess the attractiveness of the e-module. The results of the students' responses to the e-module were obtained with an average score of 3.43 with the "attractive" criteria.

4. CONCLUSION

Based on the research and discussion that has been described previously, the development of e-mathematics modules as teaching materials was developed using the modified ADDIE development model using 3 stages, such as analysis, design, development. The conclusions that can be drawn are as follows:

The development of e-mathematical modules as teaching materials was validated by experts including media experts and material experts with validation results "Good" and eligible to use.

The results of the students' responses to the e-modules as teaching materials carried out at SMP Muhammadiyah 8 Medan obtained the "attractive" criteria, so that the criteria that e-mathematics modules as teaching materials were interesting to be used in the learning process.

5. REFERENCES

- Anggoro, B. S. (2015). Pengembangan Modul Matematika Dengan Strategi Problem Solvin Guntuk Mengukur Tingkat Kemampuan Berpikir Kreatif Matematis Siswa. *Al-Jabar : Jurnal Pendidikan Matematika*, 6(2), 121–130. <https://doi.org/10.24042/ajpm.v6i2.25>

- Awaluddin, R. F. D., & Wanarti, P. (2016). PLC Untuk SMK Raden Patah Kota Mojokerto Rafiqul Fahmi Dian Awaluddin. *Jurnal Pendidikan Teknik Elektro*, 05(03), 711–716.
- Batubara, I. H., Nasution, M. D., & Wahyuni, S. (2020, October). Improving Mathematical Reasoning Ability Through Guided Discovery Methods Assisted By Autograph Software. In *Proceeding on International Conference of Science Management Art Research Technology* (Vol. 1, No. 1, pp. 71-77).
- Doly, N. M. (2021, February). Students' perception on learning mathematic during the time of covid 19. In *Journal of Physics: Conference Series* (Vol. 1778, No. 1, p. 012036). IOP Publishing.
- Fausih, M., & Danang, T. (2015). Pengembangan Media E-Modul Mata Pelajaran Produktif Pokok Bahasan "Instalasi Jaringan Lan (Local Area Network)" Untuk Siswa Kelas Xi Jurusan Teknik Komputer Jaringan Di Smk Negeri 1 Labang Bangkalan Madura. *Jurnal UNESA*, 01(01), 1–9. <https://jurnalmahasiswa.unesa.ac.id/index.php/jmtp/article/view/10375>
- Habibi, B. (2017). Pengembangan Media Pembelajaran Interaktif Multimedia Menggunakan Kvisoft Flipbook Maker Berbasis Etnomatematika. In *Jurnal Pendidikan Matematika: Vol. Vol. 1*.
- Harahap, T. H., & Nasution, M. D. (2021). Upaya Meningkatkan Pemahaman Konsep Matematika Menggunakan Model Pembelajaran Connected Mathematics Project (Cmp). *Journal Mathematics Education Sigma [JMES]*, 2(1), 8-12.
- Harahap, T. H., & Nasution, M. D. (2015). Penerapan Contextual Teaching And Learning (CTL) Untuk Meningkatkan Kemampuan Koneksi dan Representasi Matematika Siswa. *EduTech: Jurnal Ilmu Pendidikan dan Ilmu Sosial*, 1(01).
- Penerapan Model Pembelajaran Ropes (Review, Overview, Presentation, Exercise, Summary) Untuk Meningkatkan Hasil Belajar Matematika Pada Siswa MTS Hifzhil Qur'an Medan. *Education Journal of Indonesia*, 1(1).
- Nasution, M. D., & Nasution, E. (2018). PENGEMBANGAN BAHAN AJAR MATA KULIAH METODE NUMERIK DENGAN PENDEKATAN METAKOGNITIF BERBANTUAN MATLAB. *Kumpulan Penelitian dan Pengabdian Dosen*, 1(1).
- Nasution, M. D., Nasution, E., & Haryati, F. (2017). Pengembangan Bahan Ajar Metode Numerik dengan Pendekatan Metakognitif Berbantuan MATLAB. *Mosharafa: Jurnal Pendidikan Matematika*, 6(1), 69-80.
- Nasution, M. D. (2021). Beliefs of mathematics teachers on motivation and action learning models in classroom learning process: indonesian perspective. *Educational Sciences: Theory & Practice*, 21(1), 155-166.
- Nasution, M. D. (2008). Pengembangan Metode Data Envelopment Analysis Untuk Menentukan Efisiensi.
- Nasution, M. D., Ahmad, A., & Mohamed, Z. (2021). PRE SERVICE TEACHERS' PERCEPTION ON THE IMPLEMENTATION OF PROJECT BASED LEARNING IN MATHEMATIC CLASS. *Infinity Journal*, 10(1), 109-120.
- Nasution, M. D., & Oktaviani, W. (2020). Pengembangan perangkat pembelajaran matematika berbasis masalah untuk meningkatkan kemampuan pemecahan masalah siswa SMP Pab 9 Klambir V TP 2019/2020. *Journal Mathematics Education Sigma [JMES]*, 1(2), 46-54.
- Nasution, M. D., & Sari, E. T. (2019). The Influence of Cycle Learning Model on Mathematics Learning Motivation in Private Vocational School Students Harapan Mekar Medan Marelan TP 2017/2018. *IJEMS: Indonesian Journal of Education and Mathematical Science*, 1(1), 44-57.
- Nasution, M. D. (2017, October). Approaches to School Supervision in Indonesian Context. In *4th Asia Pacific Education Conference (AECON 2017)* (pp. 6-9). Atlantis Press.
- Nasution, M. D., Mawengkang, H., Kamil, A. A., Efendi, S., & Sutarman. (2020). Sample median approximation on stochastic data envelopment analysis. *International Journal of Agile Systems and Management*, 13(3), 279-295.
- Nasution, M. D. (2020). Pendekatan Sampel Median (Sample Median Approximation) pada Stochastic Data Envelopment Analysis (SDEA).
- Nasution, M. D., Batubara, I. H., Siregar, Z., & Rimbawati, R. (2021). Pemberdayaan Kelompok Pembatik Sebagai Upaya Pengembangan Kearifan Lokal Di Desa Perjaga Pakpak Bharat. *ABDI SABHA (Jurnal Pengabdian kepada Masyarakat)*, 2(2), 213-219.
- Nasution, M. D., & Prastika, C. (2020). Upaya Meningkatkan Hasil Belajar Siswa Melalui Model Pembelajaran Kooperatif Make-A Match (Mam) Pada Materi Limit Fungsi Di Kelas XI MAN 1 Medan. *Jurnal Penelitian, Pendidikan dan Pengajaran: JPPP*, 1(1), 8-15.