



DEVELOPMENT OF CONTEXTUAL E-MODULES IN MATHEMATICS LEARNING IN STATISTICS MATERIALS

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Abstract

Encouraging the use of the independent curriculum emphasizes flexibility and student-centered learning. The development of a contextual e-module provides a solution to facilitate relevant and interactive mathematics learning, particularly in statistics for eighth-grade students. This e-module is designed based on students' daily experiences, making the material easier to understand and promoting independent learning. The research method used is Research and Development (RD) with the 4D model (Define, Design, Develop, Disseminate). Validation results from the subject matter and media experts indicate that the contextual e-module in mathematics learning on statistics for eighth grade is valid. Practicality tests through teacher and student response questionnaires show highly practical results, with average scores of 3.6 and 3.5 on a maximum practicality scale of 4.0. In conclusion, the contextual e-module in mathematics learning on statistics for eighth grade has proven valid and practical for use in mathematics education and can serve as an effective and relevant learning resource tailored to students' current needs and conditions.

Keywords: E-Module, Contextual, Mathematics Learning and Statistics

INTRODUCTION

In 21st century learning, it refers to learning approaches and methods that are adapted to technological advances to meet the needs and demands of the times. According to Hamzah et al. (2023), the learning process in the 21st century requires a change in learning approaches, where the curriculum designed requires schools to change learning from teacher-centered to student-centered. Teachers must understand the basic concepts of student-centered learning if they want to change the learning approach from *teacher-centered* to *student-centered*, teachers must understand the basic concepts of student-centered learning and reflect on these learning practices (Manulang et al., 2023; Istiqomah & Nurulhaq, 2021). Teachers need to develop facility use skills, design learning experiences that support learner engagement, use technology wisely, and get the necessary training and support (Eronen & Kärnä, 2018).

Based on an interview conducted with a mathematics teacher, the learning that is currently carried out is still using the lecture method where the teacher is still a teacher-centered learning in the classroom. Some teachers already have e-modules as a reference for teachers in carrying out learning, but there are not many e-modules available in accordance with these guidelines that are used as student facilities. Therefore, it is necessary to develop e-modules as an alternative to learning implementation. E-modules can be created as a means to present learning materials in accordance with teacher guidelines, replacing physical modules that are not yet available (Rifa'i, 2019; Danuri & Choirunisa, 2023). To meet the needs of students, this e-module was developed and can be used by students independently. E-modules can also increase students' desire to learn, increase students' understanding

of material, and improve students' mathematical reasoning skills (Yulindra et al., 2023; Luthfi & Surya, 2024; Danuri & Nurjanah, 2022). The development of e-modules in current learning is very necessary in the hope that it can help teachers facilitate student learning.

Based on these conditions, e-modules made by an educator must be innovative and creative by looking at the circumstances or conditions of students. Therefore, the need for e-modules is related to daily life routines, it is hoped that with the existence of contextual e-modules, students can easily understand the material. Contextual e-modules are created and arranged by looking more at the need factors that are in accordance with current conditions and arranged in an attractive way to make the learning process more fun and meaningful. By using contextual-based e-modules, educators can create more relevant learning experiences. Students can see firsthand the application of the material they learn in their daily lives, so that it can increase their motivation and involvement in the learning process. In addition, contextual e-modules encourage learners to think critically and solve real problems, which will ultimately help them develop the skills needed in the real world. Thus, learning becomes more effective and can prepare students to face future challenges.

The contextual approach is a strategy to make connections between what learners know and how learners can be applied in the real world. The contextual approach is a learning approach that prioritizes the full involvement of students. This approach is made to help students understand the concept of the lesson by building a relationship between the subject matter and real-world circumstances (Lasarus, 2020; Rahmadani et al., 2022; Widyaputri & Agustika, 2021; Arini & Agustika, 2021). The development of contextual e-modules with the hope that it can make it easier for students to understand mathematics with contextual life or daily life (Wulandari et al., 2021; Juwantara et al., 2023). The delivery of material using a contextual approach will be much more practical and effective applied to the independent curriculum.

At the junior high school (SMP) level, especially grade VIII, students have been taught statistical material which includes analyzing data, determining the mean (average of data), determining the mode (frequently appearing) and median (middle value) of a data, and measuring the distribution of data. Because statistics are related to daily life routines, it is necessary to have modules related to daily life routines. It is hoped that students will be accustomed to using mathematical reasoning from mathematical problems with daily life related to statistics through contextual e-modules in statistics materials.

METHOD

This study uses a 4D model development design (Salsabila et al., 2023). This model consists of four stages, namely 1) the defining stage. The definition stage is useful for gathering various information about the product to be developed and determining and defining the belongings in learning. 2) Design stage. After identifying the problem at the definition stage, the design stage is carried out with the aim of creating a medium that will be used in the teaching process. 3) The

development stage. The purpose of this stage is to create a modified e-module media based on input and feedback from experts and trials given to students. 4) The stage of disseminate. The next stage is dissemination after limited testing and repair of the instrument. This stage aims to disseminate e-module media.

In this study, data collection consisted of interviews, questionnaires, and documentation. The interview type is unstructured. Researchers did not use systematic interview guidelines when gathering information from this type of free interview. Two types of questionnaires will be used for the purpose of this research, namely validator sheet questionnaires and user response questionnaires. Questionnaire validation is given to validators to verify that the e-module design developed by the researcher is valid. To test the practicality of the e-module, a user questionnaire was created and a user questionnaire was sent to teachers and students. Documentation is a data collection technique that records events or information in existing and past documents, such as making learning notes, learning pictures, or recordings of other activities.

At the data analysis stage, the questionnaire filled out by respondents and validators was measured using a value weight level with a measurement scale of 4,3,2,1. After being converted, the assessment score obtained is calculated on average and then converted into four scales of eligibility categories, namely Strongly Agree (SS), Agree (S), Disagree (TS), and Strongly Disagree (STS).

RESULTS AND DISCUSSION

The result of this study is a contextual e-module in mathematics learning in statistics materials. The research was conducted using research procedures and 4D development models consisting of the definition stage, the design stage, the development stage, and the disseminate stage. From the results of the stages of research procedures and research development which are as follows:

Analysis Stage

This early-recent analysis is a needs analysis that refers to the situation that occurs in the field. This analysis aims to find out whether e-modules need to be developed or not. Based on the observations made, the mathematics teacher stated that students do not understand mathematical concepts, and the final learning results of students are still difficult to solve mathematical problems related to daily life.

Design Stage

At the design stage, there are several things that are done by researchers in e-module development products after analyzing the test preparation, media selection, format selection, and initial design. The following is the initial plan made by the researcher. Here are some e-module designs made. Figure 1 shows the cover design of the e-module and the concept of the material to be studied.



Figure 1. E-Module Cover

Development Stage

The development stage in this study is the assessment stage of the validity of the e-module by experts, the goal is to get validation of feasibility and input related to the e-module that has been developed. The results of the validation of material experts and the validation of media experts using the assessment score guidelines. The results of the material validation carried out by the subject matter expert stated that the e-module developed was valid with improvements. The improvements include on page 4 give a number on the diagram because the numbers are not so clear, on page 28 check again related to the writing of the bibliography, and the description questions should not use stacked diagrams because they can confuse junior high school students. The results of the material validation carried out by media experts stated that the e-module developed was valid with improvements. The improvements include content in the form of images or graphics, pay attention to the font size and color content. Because if the image contains writing, it will not be clearly readable if it is too small.

Implementation Stage

After revising the product from the material validator and media validator, the researcher conducted a trial of the e-module product on grade VIII students related to the practicality test. The results of the educator's response and the student's response to the practicality test are as follows. Teachers' responses to the development of contextual e-modules to improve mathematical reasoning skills have

three aspects, namely the presentation of material, language, and usability/utilization. Table 1 results of teacher responses.

Table 1. Teacher's Response Results

Indicator	Total score	Average
Presentation of the material	46	3,8
Language	36	3,6
Uses/ Utilization	22	3,6
Conclusion	Very Practical	

In table 1, the results of the teacher's response, each indicator states that the contextual e-module in mathematics learning in statistics material has an average score of 3.6 with a very practical category. In line with the research of Irawati and Setyadi (2021) and Ramadanti et al. (2021) who explained that the development of mathematics e-modules meets practical aspects, which means that it has ease of use and application in the mathematics learning process. After carrying out the trial, the next stage is to ask for feedback/responses from students related to the development of contextual e-modules in mathematics learning in statistics materials. The students who became respondents were grade VIII students totaling 35 students. Table 2 presents the results of student responses that show very practical results.

Table 2. Student Response Results

Aspects	Average
Presentation of the mater	3,49
Language	3,47
Uses/ Utilization	3,49
Graphic	3,6
Conclusion	Very Practical

Table 2 shows the results of student responses which include four aspects including the presentation of material, language, benefits, and the appearance of viasul. These four aspects meet the practical aspects so that the e-module based on a contextual approach meets the criteria for being very practical to use by students. This result is in line with the development carried out by Hikmah and Haqiqi (2021) which modifies the e-module with the integration of scientific-based Islamic values so that it is able to create meaningful learning and encourage the improvement of students' positive character.

Disseminate Stage

At the stage of disseminating these modules, the researcher conducted a limited dissemination where the researcher disseminated and promoted the final product of the e-module in a *group discussion* forum (FGD) to teachers at SMP Negeri 1 Kembaran. The forum was attended by all teachers of grade VIII.

CONCLUSION

Based on the results of the research and development carried out, several conclusions can be obtained, including 1) Based on the results of the validation carried out, namely the material expert and the median expert stated that the e-module developed was valid with several inputs according to the notes provided by the two experts, 2) Based on the results of the questionnaire of teacher and student response, from the teacher's response the result was 3.6 with the category of very practical while the response of students obtained a result of 3.5 with a very practical category. The average results of the practicality test were obtained through the responses of teachers and students, thus being categorized as very practical so that the e-module does not need to be revised.

The research still has limitations so that it is possible to carry out further research, including updating the content of the e-module periodically in accordance with the latest developments in the field of mathematics education. For further research, it can measure the long-term impact of the use of e-modules on mathematics learning. In addition, the application of e-modules can be continued in other subjects besides statistics such as social arithmetic.

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REFERENCES

- Arini, N. L. P. D., & Agustika, G. N. S. (2021). Aplikasi pembelajaran matematika berbasis pendekatan kontekstual materi bangun datar. *Jurnal Penelitian Dan Pengembangan Pendidikan*, 5(1), 50-59.
- Danuri, D., & Nurjanah, E. (2022). Pengembangan E-Modul Model Flipped Classroom Pada Pembelajaran Untuk Meningkatkan Kemampuan Penalaran Matematis Siswa Sekolah Dasar. *Edukasi: Jurnal Penelitian dan Artikel Pendidikan*, 14(2), 85-98. <https://doi.org/10.31603/edukasi.v14i2.7906>
- Danuri, D., & Choirunisa, A. S. (2023). Pengembangan e-modul matematika model flipped classroom pada pembelajaran untuk meningkatkan kemampuan komunikasi matematis. *Trihayu: Jurnal Pendidikan Ke-SD-An*, 9(2), 196-205. <https://doi.org/10.30738/trihayu.v9i2.13710>
- Eronen, L., & Kärnä, E. (2018). Students acquiring expertise through student-centered learning in mathematics lessons. *Scandinavian Journal of Educational Research*, 62(5), 682-700. <https://doi.org/10.1080/00313831.2017.1306797>
- Hamzah, R. A., Mesra, R., Karo, K. B., Alifah, N., Hartini, A., Agusta, H. G. P., ... & Pinasti, T. (2024). *Strategi pembelajaran abad 21*. Sumatera Utara: Penerbit Mifandi Mandiri Digital.
- Hikmah, N., & Haqiqi, A. K. (2021). Pengembangan e-modul matematika terintegrasi nilai-nilai islam berbasis pendekatan saintifik pada materi bentuk aljabar. *Journal Focus Action of Research Mathematic (Factor M)*, 4(1), 125-140. https://doi.org/10.30762/factor_m.v4i1.3438
- Irawati, A. E., & Setyadi, D. (2021). Pengembangan E-Modul matematika pada materi perbandingan berbasis android. *Jurnal Cendekia*, 5(3), 3148-3159. <https://doi.org/10.31004/cendekia.v5i3.467>
- Istiqomah, Q., & Nurulhaq, C. (2021). Perbandingan Kemampuan Koneksi Matematis Siswa antara Model Pembelajaran Discovery Learning dan Ekspositori. *Plusminus: Jurnal Pendidikan Matematika*, 1(1), 135-144. <https://doi.org/10.31980/plusminus.v1i1.884>

- Juwantara, R. A., Harjanto, A., Sutiyono, A., & Utari, D. (2023). Development of contextual learning-based e-module in elementary school. *JIP Jurnal Ilmiah PGMI*, 9(1), 72-81. <https://doi.org/10.19109/jip.v9i1.18286>
- Lasarus, M. (2020). Efektivitas Pendekatan Kontekstual Dalam Pembelajaran Matematika Siswa Kelas VIII SMP Negeri 4 Sesean Satap. *Zigma: Jurnal Pendidikan Matematika*, 1(1), 9-11. <https://doi.org/10.47178/zig.v1i1.970>
- Luthfi, K., & Surya, E. (2024). Pengembangan Media Pembelajaran E-Modul Dengan Model Pembelajaran Realistic Mathematic Education Berbantuan Flip Pdf Professional Untuk Meningkatkan Kemampuan Penalaran Matematis Dan Motivasi Belajar Siswa Sma. *JIPMat*, 9(1), 51-61. <https://doi.org/10.26877/jipmat.v9i1.368>
- Manulang, L. S. J., Syahbana, A., Nasriah, N., & Ariadi, A. (2023). Penggunaan Model Pembelajaran Berpusat pada Siswa dan Media Inovatif dalam Pembelajaran Matematika. *Indiktika: Jurnal Inovasi Pendidikan Matematika*, 6(1), 21-33. <https://doi.org/10.31851/indiktika.v6i1.13474>
- Rahmadani, A., Wandini, R. R., Dewi, A., Zairima, E., & Putri, T. D. (2022). Upaya meningkatkan berpikir kritis dan mengefektifkan pendekatan kontekstual dalam pembelajaran matematika. *Edu Society: Jurnal Pendidikan, Ilmu Sosial Dan Pengabdian Kepada Masyarakat*, 2(1), 427-433. <https://doi.org/10.56832/edu.v2i1.167>
- Ramadanti, F., Mutaqin, A., & Hendrayana, A. (2021). Pengembangan E-Modul Matematika Berbasis PBL (Problem Based Learning) pada Materi Penyajian Data untuk Siswa SMP. *Jurnal Cendekia: Jurnal Pendidikan Matematika*, 5(3), 2733-2745. <https://doi.org/10.31004/cendekia.v5i3.759>
- Rifa'i, M. (2019). The development of Geogebra-based calculus e-modul assisted by Moodle website. *Math Didactic: Jurnal Pendidikan Matematika*, 5(3), 259-268. <https://doi.org/10.33654/math.v5i3.780>
- Salsabila, A. H., Iriani, T., & Sri Handoyo, S. (2023). Penerapan model 4D dalam pengembangan video pembelajaran pada keterampilan mengelola kelas. *Jurnal Pendidikan West Science*, 1(08), 495-505. <https://doi.org/10.58812/jpdws.v1i08.553>
- Widyaputri, P. N. S., & Agustika, G. N. S. (2021). Media Pembelajaran Matematika pada Pokok Bahasan Pecahan dengan Pendekatan Kontekstual. *Journal for Lesson and Learning Studies*, 4(1), 45-52. <https://doi.org/10.23887/jlls.v4i1.32741>
- Wulandari, S., Octaria, D., & Mulbasari, A. S. (2021). Pengembangan e-modul berbantuan aplikasi flip PDF builder berbasis contextual teaching and learning. *JNPM (Jurnal Nasional Pendidikan Matematika)*, 5(2), 389-402. <https://doi.org/10.33603/jnpm.v5i2.4628>
- Yulindra, D., Swastika, A., Negara, H. R. P., Setyaningsih, R., & Nurcahyo, A. (2023). E-modul e based on statistical literacy in mathematics learning. *Proceeding Of International Summit on Education, Technology, And Humanity 2021*, 2727(1), 020075. <https://doi.org/10.1063/5.0141914>