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Utilization of Concept Rich Instruction Based Kahoot Application to Improve Mathematical Critical Thinking Skills

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Abstract. *This research aims to develop an e-module based on Concept-Rich Instruction in the subject of straight-line equations in grade VIII of junior high school to improve students' mathematical critical thinking skills. This research uses the ADDIE research model which consists of 5 stages, namely Analysis, Design, Development, Application, and Evaluation. The validity instrument in the form of a validation questionnaire from material experts and design experts obtained a percentage value of 82.23% for expert validation and 84% for design validation in the valid category. The practicality instrument in the form of a practicality questionnaire for teachers and students obtained percentage scores of 98.88% and 91.59% respectively which were included in the very practical category. The effectiveness instruments were in the form of pre-test and post-test obtaining an average n-gain score of 66.33% with the category tafsran quite effective. Furthermore, the student response questionnaire obtained a result of 81.16% which was included in the category of very effective. Based on this analysis, e-modules are feasible to improve students' mathematical critical thinking skills.*

Keywords: *Concept Rich Instruction, Kahoot, Mathematical Critical Thinking.*

Abstrak. Penelitian ini bertujuan untuk mengembangkan sebuah e-modul berbasis Concept-Rich Instruction pada mata pelajaran persamaan garis lurus kelas VIII SMP untuk meningkatkan kemampuan berpikir kritis matematis siswa. Penelitian ini menggunkan model penelitian ADDIE yang terdiri atas 5 tahapan yakni Analisis, Desain, Pengembangan, Penerapan, Evaluasi. Instrumen kevalidan berupa angket validasi dari ahli materi dan ahli desain memperoleh nilai presentase validasi ahli sebesar 82,23% validasi desain sebesar 84% dalam kategori valid. Instrumen kepraktisan berupa angket praktikalitas guru dan siswa memperoleh nilai persentase berturut turut 98,88% dan 91,59% yang termasuk kategori sangat praktis. Instrumen keefektifan berupa pre-test dan post-test dengan memperoleh nilai rata rata n-gain sebesar 66,33% dengan tafsran kategori cukup efektif. Selanjutnya angket respon siswa memperoleh hasil 81,16% yang termasuk kategori sangat efektif. Berdasarkan analisis tersebut e-modul layak digunakan untuk meningkatkan kemampuan berpikir kritis matematis siswa.

Kata Kunci: Concept Rich Instruction, Kahoot, Berpikir Kritis Matematis.

INTRODUCTION

The learning process is a process in which there is interaction between teachers and students and mutual communication between the two. Learning is said to be successful if there is an improvement and development of the quality of learning. As a science that is able to hone the ability to grasp and think critically, mathematics is one of the sciences that must be understood by students. Mathematics is one of the basic sciences that has an important role both in daily life and in the development of science and technology. Mathematics should be seen as a science that can be used in daily life but students have not been able to feel it (Haeruman et al., 2017) revealed that the problem is due to mathematics learning in schools that is not related to daily life. This means that the learning carried out has not been able to improve students' reasoning and mathematical critical thinking skills. The ability to think critically mathematically is an important component that students must have, especially in the mathematics learning process.

According to (Ennis, 1991), critical thinking is rational reflective thinking focused on deciding what to believe or do. So that several things must be done by teachers to encourage students' critical thinking skills, including: determining the focus of the discussion, teachers asking questions, teachers helping students think about problem solving, and teachers asking students to make problem-solving decisions. Students can be said to have good critical thinking skills if they meet the following indicators: a) Focus, related to the main concern in understanding the problems in the given questions; b) Reason, related to

identifying and assessing the truth of the reason, namely providing reasons based on relevant facts/evidence at each step in making answers from each step or conclusion.; c) Inference, related to the assessment of the quality of conclusions, assuming that the reason for being acceptable is to make the right conclusion and be able to provide or choose the right reason to support the conclusion made; d) Situation, which relates to the situation carefully, namely using all information based on data, reports, principles, evidence, assessments, beliefs, opinions, concepts, descriptions, questions, or other forms of representation that are relevant or in accordance with the problem; e) Clarity, which is related to clarity, Check to ensure that the language is clear, namely able to state the results of reasoning, justify or clarify the reasoning based on consideration of evidence, concepts, methodologies, criteria and context; and present reasoning in the form of valid and convincing arguments; f) Overview, which is related to rechecking or stepping back and looking at everything as a whole, namely rechecking each step that has been carried out (Ennis, 1991).

To improve critical thinking skills, one of the steps that can be taken is the use of supportive teaching materials. One of the pedagogic abilities of teachers is to be able to design and implement learning and be a good facilitator in developing student potential (Pratama & Retnawati, 2018). In addition, teachers can utilize digital technology as a learning medium to improve mathematics learning (Larkin & Calder, 2015) by developing interactive teaching materials such as e-modules. E-modules can be added with other technologies so that learning can be more interesting for students. Technology is intended so that students can get to know technology in their learning, because technology will increase students' insights.

E-module is an independent teaching material that has been systematically arranged into a certain learning unit, the presentation is presented in electronic form, each existing learning activity is connected with a link as a link that makes students more interactive with the teaching material, the e-module is also equipped with the presentation of tutorial videos, animations and audio to add to the learning experience. As a study (Heswari & Patri, 2021) that e-modules are able to improve students' logical thinking skills, which is shown in a positive category on the effectiveness of use, learning motivation, and student learning activities. In addition, research (Diana et al., 2020) produced e-modules that are able to provide new insights and the modules developed received very interesting responses and were very suitable for use as teaching materials for teachers.

Based on the potential problems that occur, the e-module to be developed should contain problem-based learning in order to improve students' mathematical critical thinking skills. One approach that can be used is the Concept-Rich Instruction approach. The Concept-Rich Instruction approach is a learning approach that pays attention to conceptual, cognitive, and metacognitive knowledge in learning as well as in the mathematical thinking process. Concept-Rich instruction is a mathematical learning method that refers to constructivist understanding, meaningful learning theory, and problem-solving approaches (Kusmayanti et al., 2017). In addition, according to (Ben-Hur, 2006), Concept-rich instruction is a teaching and learning approach that cares about students' understanding of concepts in the teaching and learning process. Concept-Rich instruction is a process with five stages, namely practice, decontextualization, generalization in words, recontextualization, and realization.

The use of the Concept-Rich Instruction approach is supported by research (Kusmayanti et al., 2017) which concludes that the Concept-Rich Instruction approach is able to improve mathematical problem-solving skills in mathematics learning. The increase in student understanding is seen from the increase in the results of the pretest and posttest conducted by students. The relationship between concept understanding and mathematical critical thinking ability makes researchers interested in choosing this approach to improve students' mathematical critical thinking skills. In addition, other research proves that mathematics learning with Concept-Rich Instruction can enrich students' understanding of concepts with their learning stages that lead students to build their own knowledge, understand the importance of understanding concepts that will also have an impact on mathematics learning outcomes (Ratnani & Afifah, 2018). In line with the formulation of the problem, the objectives of this study are a) To describe the procedure for developing e-module teaching materials based on Concept-Rich Instruction assisted by kahoot applications to improve mathematical critical

thinking skills in straight line safety materials in grade VIII of junior high school; b) Describe the quality of e-module teaching materials based on Concept-Rich Instruction assisted by kahoot applications to improve mathematical critical thinking skills in straight line safety materials in grade VIII of junior high school.

METHODS

This research method uses the Research and Development method which refers to the ADDIE (Analyze, Design, Development, Implementation and Evaluation) model (Branch, 2009) the flow of this method can be seen in the Figure 1.

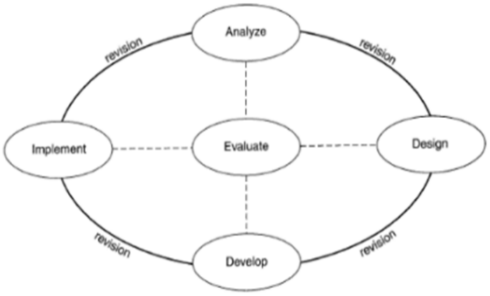

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Figure 1
ADDIE Design

The data analysis stage is carried out through the needs analysis stage, student characteristics analysis and initial ability analysis. The design stage will produce an initial chart or storyboard of the initial product in the form of an e-module designed in the study. The development stage will make teaching materials that will be developed. The implementation stage is the stage to pilot the e-module to students, where previously it had been tested for validity by 2 teachers and 9 students in one of the schools in Jambi City, then the e-module was implemented in learning activities for 4 meetings. The last is the evaluation stage, which is carried out to be reflected and revised, starting from the analysis stage to the implementation stage.

RESULTS

Analyze

Based on the results of observations, teachers at one of the schools in Jambi City revealed that they had never made an e-module during the semester, learning was carried out only using books and LKS provided by the school. Initial observation was also carried out a test of mathematical critical thinking ability, students had difficulty in understanding the story problems shared by the researcher. In addition, interviews with students revealed that the teaching materials used should be able to display audio-visual discussions about problem solving. To support learning to be able to improve mathematical critical thinking skills as a solution, the right teaching materials are needed to support students in terms of mathematical critical thinking. One of the right supporting teaching materials is the E-module based on Concept Rich Instruction, an innovative learning approach to improve mathematical critical thinking skills assisted by kahoot applications to make learning more interesting.

Design

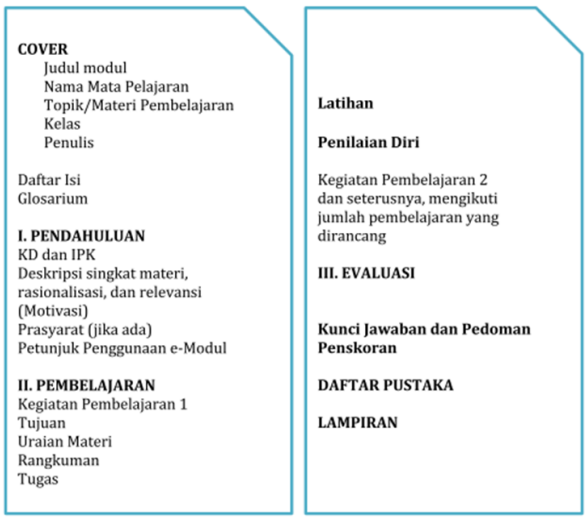

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Figure 2
Preparation of e-modules

The material in the mathematics lesson is selected is the material of straight line equations in grade VIII of junior high school in accordance with the 2013 Curriculum. The material developed will go through 5 stages of Concept Rich Instruction (practice, decontextualization, generification with words, recontextualization and realization). The e-module will be designed with the canva application, then it will be combined with the kahoot application and the video discussion of the questions that will be converted using the flip pdf professional application as shown in the following Figure 2.

Development

The development of e-modules based on Concept Rich Instruction assisted by kahoot applications begins with the validation of the instruments used in accordance with the instrument validation scheme. The validation used is the validation of material experts and the validation of design experts for the creation of the e-module, the results of the validation of the instrument can be seen in Table 1.

Table 1
Material Expert Validation Results

No.	Aspects	Score	Maximum Score
1.	Content eligibility	20	25
2.	Component eligibility	19	20
3.	Linguistics	15	20
4.	Characteristic CRI	20	25
	Sum	74	90

Source: processed data

In addition to material validation, e-modules also need to be validated by design experts, the results of the validation can be seen in the Table 2.

Table 2
Results of Validity of Design

No.	Aspects	Score	Maximum Score
1.	Writing on the cover of the e-module	12	15
2.	Writing on the content of the e-module	13	15
3.	Display of the e-module cover	18	20
4.	Design of e-module content	20	25
	Sum	63	75

Source: processed data

Based on the assessment of material experts, a total score of 74 and a maximum score of 90 were obtained, so that the percentage of assessments from material experts was obtained of 82.23% which was included in the valid category. Meanwhile, for the assessment from design experts, a total score of 63 and a total score of 75 were obtained, so that a percentage of 84% was obtained which was included in the valid category. After the validity test, the practicality test of the e-module is carried out by mathematics teachers, the results of the practicality test can be seen in the following Table 3.

Table 3
Teacher Plasticity Test Results

No.	Aspects	Score	Maximum Score
1.	Content Eligibility	30	30
2.	Language Usage	14	15
3.	Display	15	15
4.	Component Fittings	20	20
	Sum	89	90

Source: processed data

Based on the assessment of material experts, a total score of 89 and a maximum score of 90 were obtained, so that the percentage of assessments from material experts was obtained of 98.88% which was included in the very practical category. In addition, a practicality test was also carried out by students where the results can be seen in the Table 4. Based on the evaluation of 9 students regarding the practicality of the e-module, a total score of 577 and a maximum score of 630 were obtained, so that the percentage of assessment from material experts was obtained of 91.59% which was included in the Very Practical category.

Table 4
Student Practicality Test Results

No.	Aspect	Score	Maximum Score
1.	Content Eligibility	211	225
2.	Language Usage	122	135
3.	Display	244	270
	Sum	577	630

Source: processed data

The product was implemented on field tests for 4 meetings. Before piloting the e-module, students were given a pre-test so that they could see an improvement in students' mathematical critical thinking skills. This test was carried out in one class. After the implementation, students are given *a post-test* to see the improvement of students' mathematical thinking skills, the results of the average score of the pretest, posttest and N-gain from the results of the mathematical critical thinking ability test can be seen in the following Figure 3.

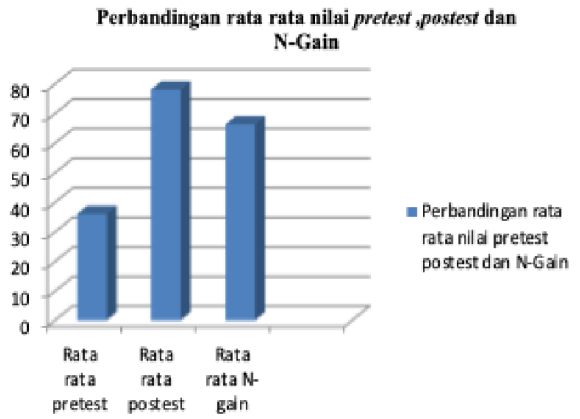

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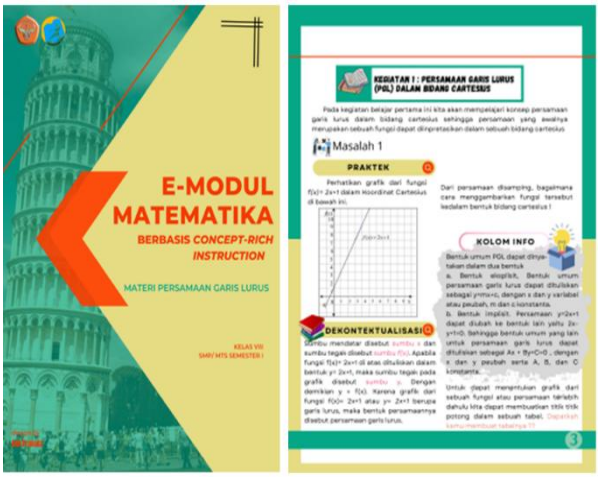
Figure 3
Comparison of pre-test, post-test and n gain scores.

In the N-Gain mathematical critical thinking ability test from 30 students, there were 29 students who experienced an increase in high and/or moderate mathematical critical thinking skills by obtaining an average N-gain of 66.33% with a fairly effective category interpretation. The results of this study show that there is an average increase in pre-test and post-test nlai so that E-Module based on Concept Rich Instruction is feasible to be used to improve students' mathematical critical thinking skills.



Source: processed data

Figure 4.
Trailer of the e-module

Evaluation can be in the form of suggestions, improvements, comments and input from students, teachers and validators. The suggestion has been improved through the revision process and the results of the revision have been revised by the validator so that an e-module based on Concept Rich Instruction has been formed which is developed as follows Figure 4. After the teaching materials are developed into e-modules based on Concept Rich Instruction, students become more aware of the material presented. As researched by Rismayanti et al., (2022), using teaching materials e-modules e-modules assisted by codulars on smartphones meets the learning needs of students with students' mathematical problem-solving skills so that they can improve students' mathematical critical thinking skills.

The advantage of this e-module is that the e-module is arranged with a simple and consistent appearance so that it is easy to use in studying the module, the material presented in the e-module refers to the syllabus so that it can help students in achieving the expected competencies in mathematics lessons, the videos presented in this e-module are simple and easy to understand so that they can help students in increasing their understanding of the material in

the e-module, and the interactive quizzes presented in this electronic module are directly included with the scores of student answers so that students can directly measure the achievement of student learning outcomes. The disadvantages of this electronic module are that there are no answer sheets for formative tests and there are no interactive quizzes in each learning activity.

The results of this research are in the form of e-modules based on Concept Rich Instruction assisted by kahoot applications to improve mathematical critical thinking skills in design using the ADDIE model with 5 stages (analysis, design, development, implementation, evaluation). The content of the e-module based on Concept Rich Instruction is designed using the Concept Rich Instruction Approach which consists of 5 stages (practice, decontextualization, generalization with words, recontextualization and realization). And equipped with learning videos, sample questions, practice questions assisted by the kahoot application to make learning more fun.

The e-module based on Concept Rich Instruction developed is declared valid, practical, and effective in improving mathematical critical thinking skills. The percentage of expert validation is 82.23%, and the design validation is 84% in the valid category. The practicality test by the teacher was 98.88% and the practicality by 9 students in different categories was 91.59% which was included in the very practical category. The effectiveness test obtained an average n-gain score of 66.33% with the category tafsran quite effective. Furthermore, the student response questionnaire obtained a result of 81.16% which was included in the category of very effective. Based on this analysis, the e-module is feasible to be used to improve students' mathematical critical thinking skills.

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