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Development of E-Modules Based on Socio-Scientific Issues to Improve The Creative Thinking Skills of High School Students

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Abstract. The research aims to develop e-modules based on socio-scientific issues that are feasible to use, determine the response of grade X students to the use of e-modules based on socio-scientific issues and determine the increase in creative thinking of grade X students. This development research is based on the 4-D model which includes four steps namely Define, Design, Develop, Disseminate. This research was conducted until the Develop stage due to the limited time of researchers in conducting research. The subjects of this study were 33 grade X students. The instruments used were expert validation assessment sheets, student response questionnaires and creative thinking skills test questions. The results of this study indicate that e-modules based on socio-scientific issues are very feasible to use because the use of e-modules can improve students' creative thinking skills with an average percentage of 91%. Students' creative thinking skills obtained an N-Gain value of 0.76 (high category). Students' response to the e-module based on socio-scientific issues is included in the very good category because this e-module presents subject matter and explanatory videos on each topic and improves students' creative thinking skills with an average percentage of 87%. Based on these results, it can be concluded that the e-module based on socio-scientific issues developed is very feasible to use.

Keywords: E-module, socio-scientific issues, creative thinking

1. Introduction

Technological developments in Education In the era of the industrial revolution 5.0, it can affect the teacher-centered learning system to become student-centered that emphasizes problem-solving and creativity. In Indonesia, the application of learning technology is used to support learning that is more interesting, effective and efficient. The application of learning technology is used, among others, to develop teaching modules. According to Andi [1] The module is a teaching material that is systematically arranged using language that can be easily understood by students according to their level of knowledge and age, so that they can learn on their own with minimal guidance from educators.

Teaching modules can be presented as electronic modules (e-Modules) that can be easily accessed and used by students. Electronic module is a learning media designed in the form of a digital book that displays data or material such as text, graphics, audio, animation, and video that are used electronically that can be read using CDs, PCs, and smartphones [2].

E-modules can be used in physics subjects as one of the alternative teaching materials that students can use. Physics is a branch of science that focuses on studying nature and its environment. Physics lessons are considered complex and do not interest students in studying them [3]. Physics lessons study several phenomena that occur around you. One of the material topics in physics lessons is renewable energy. Approach socio-scientific issues can be used in the development of renewable energy materials in E-Modules.

Socio-scientific issues is a learning approach that Displays issues or issues that occur around the student's residential environment [4]. This approach is carried out because it can display social issues related to science in the environment to be able to increase students' creative thinking in creating or

determining solutions to existing problems or issues [5]. This is in line with the research to be carried out where the researcher uses the socio-scientific issues by presenting issues or problems that exist in the student environment as the basis for learning.

The development of this socio-scientific issues-based e-module aims to improve students' creative thinking skills. Students are expected to be able to provide solutions to issues or problems that exist in the environment around students with the discussion material presented, namely renewable energy class X. The socio-scientific issues developed in this E-Module are in the form of social issues in Bengkulu Province.

Creative thinking is an ability which is related to creativity which means a way of thinking a person to develop or change a problem, see the problem from a different perspective, and be open to many ideas even uncommon ideas [6]. Creative thinking skills are included in high-level thinking skills. Students who have the ability to think creatively can develop their ideas.

According to Sudarma [7] creative thinking is an intelligence that develops in individuals, in the form of attitudes, habits, and actions in giving birth to something new and original in solving problems. Students can develop creative thinking skills in school as capital to be able to solve problems and find a concept. This creative thinking ability also needs to be possessed by students in facing learning in this era of globalization.

Indicators of creative thinking according to Triffinger [8] namely smoothness, flexibility, originality and elaboration. Fluentness refers to the ability to generate a number of ideas in response to celebrations. Flexibility refers to the ability to shift the direction of one's thinking or change one's point of view. Flexibility involves being open to examining ideas or experiences in varied ways to find promising possibilities. Originality refers to the ability to generate new and unusual ideas. Originality is concerned with options that are statistically unusual or rare, i.e. ideas offered by a small number of people in any given group. Elaboration refers to the ability to add details and expand ideas. Elaboration involves creating richer, more interesting and more complete ideas.

The ability to think creatively has the characteristics of being able to spark many ideas, answers or problem solving, provide many ways or suggestions to do various things and always think of more than one answer. In flexibility, students can produce varied ideas, answers or questions, can see problems from different perspectives and are able to change the way of approaching or thinking. In originality, students are able to give birth to new and unique expressions that are different from others, and are able to make unusual combinations (rarely given by most people) of parts or elements for problem-solving strategies. In the elaboration of students, Able to enrich and develop an idea or product and adding or detailing details of an object, idea or situation so that it becomes more interesting [6].

Based on the results of the distribution of the needs questionnaire to 33 students in class X, it is known that the material in physics learning is still centered on the teacher where the teacher explains to the students the material to be taught so that students are not actively involved during the learning process. So far, learning has only been limited to using printed books and media in the form of power points as learning resources. Therefore, students also want teaching materials that can be accessed online which contain explanations in the form of materials, explanatory images and videos that can be directly displayed when students are learning.

Based on the results of interviews with physics teachers, it is known that the curriculum used is an independent curriculum. It is also known that during the learning process, the teacher has used power point media and displayed videos during learning, but not all subject matter uses this media. The teacher also said that electronic learning media today is more practical and interesting to use in the learning process. However, during the learning process, printed teaching materials are still often used rather than electronic teaching materials.

This research was developed from the research of Syarlisjiawan [9] who developed physics e-modules with Canva: integrating socio-scientific issues for today's learning. the above research aims to increase environmental awareness and critical thinking skills. While the research to be developed focuses on developing e-modules based on scientific issues to improve the creative thinking skills of high school students. This study uses variables of renewable energy material, scientific issues in Bengkulu, and creative thinking skills. the use of scientific issues in Bengkulu because there are still many renewable energy sources that can be utilized but have not been used properly. the issue is used

as learning material that can provide students with creative ideas related to the utilization of energy in accordance with existing issues. There has never been a similar study on SSI e-modules to improve the creative thinking skills of high school students in Bengkulu as seen from the literature review of Syarlisjiawan [9] developed SSI-based physics e-modules to improve students' critical thinking skills. The results showed that the e-module was effective in improving students' critical thinking skills and Suryani [5] developed SSI-based physics e-modules using Flip PDF Professional software for momentum and impulse materials. The results showed that the e-module can improve students' physics concept understanding ability. However, previous research has not discussed the development of SSI e-modules to improve the creative thinking skills of high school students in Bengkulu. Therefore, this research aims to fill the gap.

This research was developed from research of Syarlisjiawan [9] who developed physics e-modules with Canva to increase environmental awareness and critical thinking skills. environmental awareness and critical thinking skills. This research focuses onthe development of e-modules based on socio-scientific issues to improve creative thinking skills of high school students in Bengkulu. This research uses renewable energy material, socio-scientific issues in Bengkulu, and creative thinking ability variables.

Based on the description above, electronic teaching materials in the form of e-modules that can be accessed by students online using the socio-scientific issues approach. The purpose of this study is to develop e-Modules that are suitable for use, to find out the response of students after using the e-Module and to know the improvement of students' creative thinking.

2. Method

The method used in this study is research Research & Development (RnD), which is a development research that focuses on producing new products or developing existing products [10]. The research model used is the 4-D development model. define, design, developand disseminate. For this study, the researcher only did it to the limit develop due to the limited time of researchers to conduct research. For the stages of the RnD research method on the 3-D model, you can see in Figure 1.

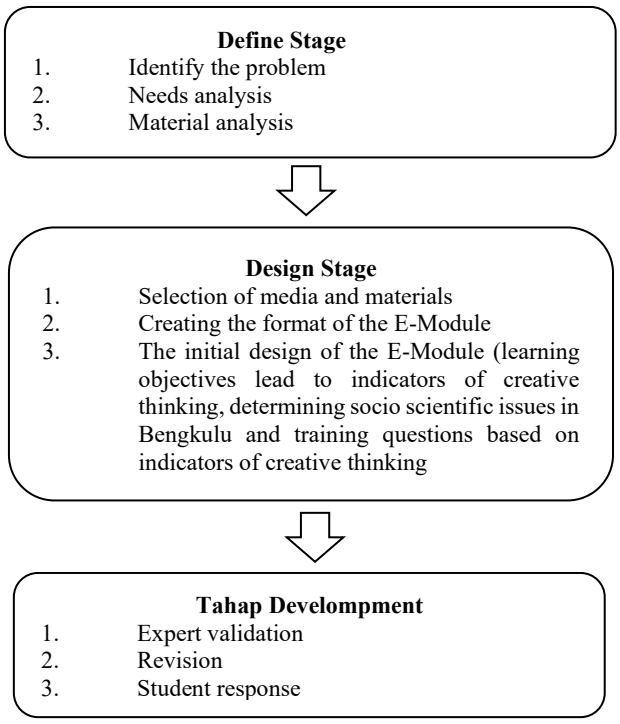

Figure 1. Research stages of e-module development.

At the definition stage, it is carried out by identifying problems with observation, analyzing the needs of teachers and students by distributing needs questionnaires and interviews and analyzing the material by paying attention to the learning outcomes in the material. At the design stage, it is carried out by selecting media and materials, then making an e-module format and then determining the initial design of the e-module. At the development stage, validation is carried out to experts, including media validation, then revisions are made in accordance with the suggestions and input of validators, then a student response questionnaire is distributed to find out the student response after using the e-module.

Participants in this study consisted of two physics education lecturers from the University of Bengkulu, one physics teacher and students of MAN 2 Bengkulu City. Physics education lecturers at the University of Bengkulu and physics teachers at MAN 2 Bengkulu City became a team of experts or validators in the development of e-modules based on socio-scientific issues to provide assessments based on components of the feasibility assessment aspect. The subject of this product trial was carried out to 33 students of MAN 2 Bengkulu City. This research was conducted during the odd semester of the 2024/2025 school year.

The data in this study was obtained from data collection techniques, namely interviews, questionnaires, and tests. Interviews are used for identify the needs and problems that exist in the learning process. The data obtained by the interview technique were analyzed using descriptive analysis techniques. The data collection technique uses two questionnaires, namely an expert validation questionnaire given to validators to assess the feasibility of the developed learning media and a student response questionnaire to collect data on student opinions on the development of e-modules based on socio-scientific issues. To measure students' creative thinking ability, the researcher used quantitative and qualitative analysis techniques to compare the pretest scores given before the implementation stage began to see the level of students' initial ability and the posttest was used after the implementation stage was completed. The data results obtained from expert validation scores and student responses were then analyzed using the Likert scale approach to assess the feasibility of the learning tools that have been made. To see the category of improving students' creative thinking, please see Table 1.

Table 1. Category of improving students' creative thinking [11].

Average	Criterion
$g > 0.7$	Tall
$0.3 \leq g \leq 0.7$	Keep
$0 < g < 0.3$	Low
$g \leq 0$	Fail

Data analysis of improving students' creative thinking using the formula [12] Normalized average gain or N-gain in the following equation:

$$N - Gain = \frac{score\ Posttes - score\ Pretest}{maximun\ score - score\ Pretest}. \quad (1)$$

This improvement in creative thinking ability is carried out using written tests before and after using the developed media. The creative thinking test can be seen in Table 2.

Table 2. Creative thinking ability test.

No	Creative Thinking Indicators	Question Indicators	Question Type
1	Fluency	Questions are presented to involve peers. Students are able to care and contribute to renewable energy issues.	Description
2	Flexibility	It was presented about a village experiencing a clean water crisis. Students are expected to be able to make products. Students are able to detail the products they design.	Description

No	Creative Thinking Indicators	Question Indicators	Question Type
3	Original	A problem is presented to consider factors in designing wind power plants in coastal areas	Description
4	Original	Presented with an illustration of vacant land. Students are able to find creative ideas for the development of renewable energy	Description
5	Elaboration	Questions are presented for students to be able to make products. Students are able to detail the products they design	Description

3. Results and Discussion

3.1. *Result*

This study aims to describe the feasibility of e-modules based on socio-scientific issues to improve the creative thinking of high school students, describe the response of students after the use of e-modules and measure the improvement of students' creative thinking skills. The results of the research related to the development of e-modules based on socio-scientific issues to improve the creative thinking of high school students include three stages, namely define, design and develop.

3.1.1. Define stage

The first stage is the definition stage. This definition is done by identifying the problem where the identification is carried out by making observations. Then an analysis of the needs of teachers and students was also carried out. To find out the needs of teachers, the researcher conducted interviews with teachers to find out the needs of teachers during learning activities. The needs of teachers include facilities and infrastructure, learning media, learning methods that are often carried out in schools. To find out the needs of students, a questionnaire on student needs was distributed. At this stage, material analysis is also carried out to find out that this subject matter can be used in this research. The researcher analyzes the subject matter by looking at the learning outcomes in the subject chapter that the researcher will do, namely renewable energy material.

Based on the results of interviews with subject teachers, the results were obtained that the curriculum used was an independent curriculum. There was a time when the learning process of the teacher had also used the media power point and display videos during learning but not all subject matter uses this media. The teacher also said that electronic learning media today is more practical and interesting to use in the learning process because it can be used anywhere and anytime. However, during the learning process, teachers still often use printed teaching materials rather than electronic teaching materials.

The researcher also conducted an analysis of student needs. This needs questionnaire was filled out by 33 students. Based on the results of the questionnaire distribution, it is known that the learning process is still carried out conventionally where the explanation of subject matter in physics learning is still centered on the teacher. The teacher explains to the students the material to be taught so that students are not actively involved during the learning process. So far, learning has only been limited to using printed books and media in the form of power point as a source of learning. Therefore, students also want teaching materials that can be accessed online which contain explanations in the form of materials, explanatory images and videos that can be directly displayed when students are learning. Therefore, as a school that has used the independent curriculum, it should have implemented student center where students are actively involved in the learning process and not only get an explanation of the subject matter from the subject teacher concerned.

The analysis of subject matter is also carried out at this stage. The researcher analyzed the subject matter used for the implementation of this media by looking at the learning outcomes on the topic of the material to be used, namely the renewable energy material in class X. These learning outcomes are then derived into learning objectives which are then used as a way to achieve these learning outcomes.

3.1.2. Design Stage (Planning)

The planning stage is the second stage in this study. At this stage, the information in the previous definition stage has been collected. This planning stage also provides preliminary information about the design of the e-module that is made. Before the preparation of this e-module, there are several things that must be considered, such as choosing media and subject matter as well as social issues in the surrounding environment, especially the Bengkulu area. Then also prepare test questions that refer to indicators of creative thinking. The selection of media and formats used to be relevant to the characteristics and needs of students. The media platforms used are Canva Pro and Heyzine Flipbook. Initial design needs to be done before development tests are carried out. The following results of the initial design of the e-module developed by the researcher can be seen in Table 3.

Table 3. Initial design of e-module.

No.	Design
1	Cover The cover contains the title, subject matter, grade level, school year, and author. The image was chosen because it was in accordance with the subject matter raised about renewable energy, and renewable energy must be found in order to be used.
2	Instructions for using the e-Module Contains information about the use of e-modules.
3	Explanation of the e-Module section Contains information about the definition of e-module and the parts contained in it and its explanation.
4	Concept map Contains a summary of the material in the e-module.
5	Learning Objectives and Learning Outcomes Learning Outcomes: Contains information about learning outcomes in accordance with the curriculum used, namely the independent curriculum. Learning Objectives: Contains learning objectives in e-modules based on creative thinking.
6	Isu socio-scientific issues Displaying social issues in Bengkulu Province related to renewable energy.
7	Subject matter It contains learning concepts that are presented in detail and concisely accompanied by explanatory images on each sub-material of the discussion.
8	Learning and Refocus videos on socio-scientific issues Learning Videos: Contains explanatory videos related to the material in each learning activity. Refocus Isu socio-scientific issues: Contains exercise questions related to socio-scientific issues and uses creative thinking indicators.
9	Summary Contains material on summary information in e-modules.
10	Bibliography Contains material source references in e-modules.
11	Glossary Contain important terms in the text with an explanation of the meaning of the terms.

3.1.3. Development stage

This development stage is the third stage in this research. At this stage, the researcher conducts validation tests, revisions, tests creative thinking skills and sees students' responses after using media.

1) *Validation test*

This validation test was carried out to determine the feasibility of the media developed by the researcher. This feasibility test was carried out by three experts, namely two experts from Physics Education Lecturers at the University of Bengkulu and one expert from physics teachers MA N 2 Bengkulu City. The results of the validation carried out by the expert team on e-module media based on socio-scientific issues to improve the creative thinking of high school students, an average percentage of 91% was obtained with a category of very feasible criteria in all aspects measured. These aspects include the

feasibility of content, the feasibility of presentation, the feasibility of language, the feasibility of media, and the aspect of creative thinking. The results of product validation can be seen in Table 4.

Table 4. Feasibility results of e-module based on socio-scientific issues to improve creative thinking of high school students.

Assessment Aspects	Response	
	Score	Qualitative Category
Content Eligibility	86%	Very Feasible
Eligibility of Serving	95%	Very Feasible
Language Eligibility	92%	Very Feasible
Media Eligibility	96%	Very Feasible
Creative Thinking Skills	83%	Very Feasible

2) *Revision*

At this revision stage, it is carried out after the data analysis process provided by the validator and improvements in accordance with the validator's suggestions and inputs after assessing the media products used. Improvements to the development of e-modules based on socio-scientific issues to improve the creative thinking skills of high school students are carried out as an effort to improve the media so that it can be used. The following are suggestions for improvement by validators on the development of e-modules based on socio-scientific issues to improve the creative thinking skills of high school students.

Improvement of the addition of socio-scientific issues is shown in Figure 2. The display after adding socio-scientific issues can be seen in the image above where socio-scientific issues are presented clearly and in detail accompanied by pictures of the location of the issue so that students can access the issue easily without having to scan the barcode first.

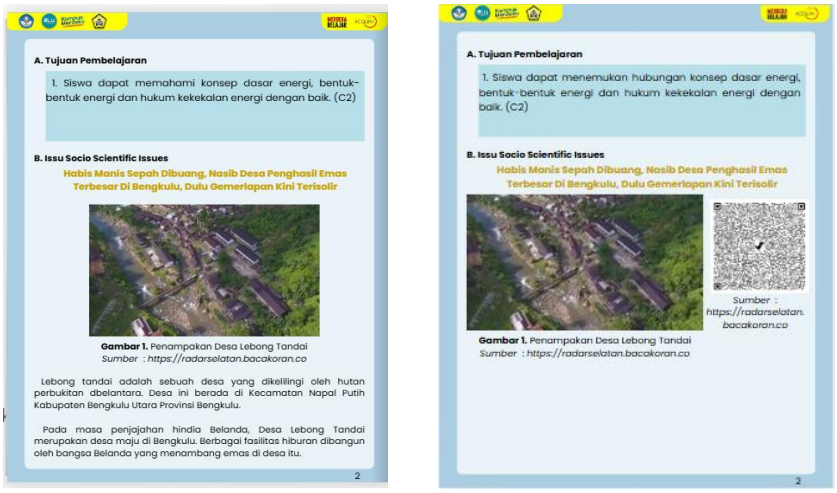

Figure 2. View before (left) and after (right) adding socio-scientific issues.

Improving learning objectives is shown in Figure 3. The display before the improvement of learning objectives in the module above (left) can be seen that the learning objectives have not referred to the ability to think creatively but rather to the ability to think critically. The display after improving the learning objectives (right) in the module above can be seen that the learning objectives have referred to the ability to think creatively.

Improvement of refocus socio-scientific issues is shown in Figure 4. The view before the improvement of the socio-scientific issues refocus questions in the module above can be seen that the refocus questions do not refer to the ability to think creatively but rather to the ability to think critically. The appearance after the improvement of the socio-scientific issues refocus questions in the module above can be seen that the refocus questions have referred to the ability to think creatively. These questions can be used so that students can find solutions or ideas for existing problems.

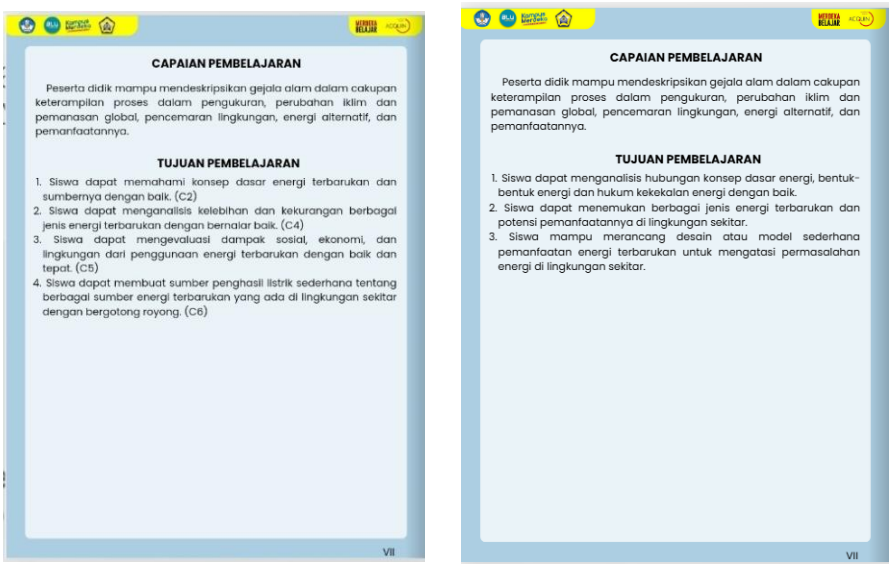

Figure 3. Display before (left) and after (right) the improvement of learning objectives.

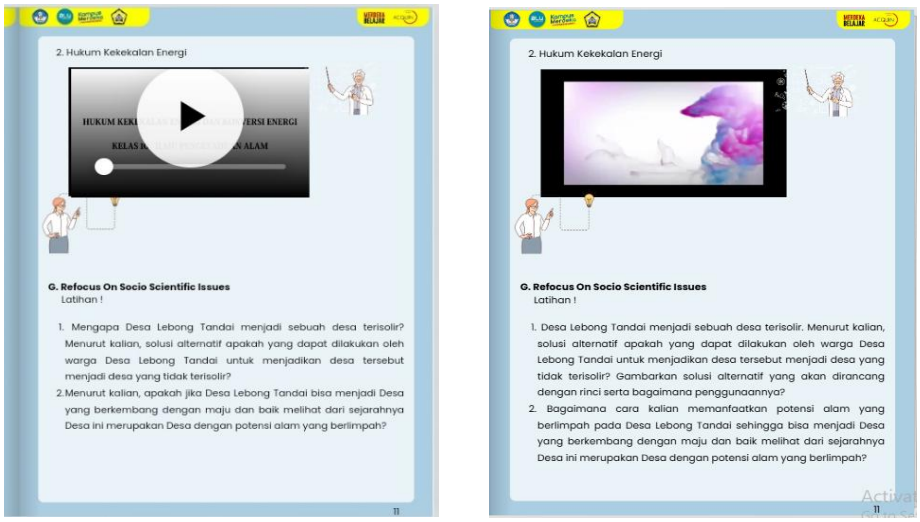

Figure 4. View before (left) and after (right) the improvement of refocus socio-scientific issues.

3) *Student Response*

After e-module based socio-scientific issues to improve the creative thinking skills of high school students has been declared very feasible by experts, then the media is used in learning as well as a form of development trial in the field. The product trial was carried out to class X students totaling 33 students at MA Negeri 2 Bengkulu City. In this implementation activity, there will also be a measurement of students' creative thinking skills and student responses. The measurement of students' creative thinking ability will be measured by doing Pretest and Posttest. Where Pretest This is done before using e-based modules socio-scientific issues, while Posttest conducted after e-module based socio-scientific issues Used. The learning outcomes of students before and after using e-modules based on socio-scientific issues where data was obtained on the improvement of students' creative thinking ability by 0.76 and the N-Gain percentage rate of 76%. So, based on the category Increased Creative thinking skills students are high. This shows that e-module-based socio-scientific issues can improve students' creative thinking skills.

The N-Gain value of creative thinking skills on each indicator can be seen in Table 5. Based on the test to determine the improvement of creative thinking skills tested on 33 students, it was known that there were 23 students who obtained n-gain scores in the high category and 10 students who obtained n-gain scores in the medium category. These results show that there is an increase in students' creative

thinking skills. The results are clarified in Table 5 that there is a high increase in each indicator of creative thinking and based on the assessment carried out on each student, it is known that there are 23 students who are included in the high category. Therefore, the overall n-Gain value obtained is in the high category.

Table 5. N-gain value on creative thinking indicator.

Creative Thinking Indicators	Average Pretest Score	Average Postest Score	N-Gain
Fluency	27	80	0.73
Flexibility	48	91	0.83
Original	41	88	0.80
Elaboration	40	89	0.82

The results of students' responses to learning media can be seen in Table 6. Based on the results of student responses based on e-modules socio-scientific issues to improve the creative thinking of high school students. Table 6 shows that the overall average score of the percentage of student responses is 87%, with very good criteria in all aspects measured. This states that most students are interested in e-modules based on socio-scientific issues to improve the creative thinking of high school students in the learning process.

Table 6. Results of student response to socio-scientific issues-based e-module to improve creative thinking skills of high school students.

Assessment Aspects	Response	
	Score	Qualitative Category
Display	85%	Very Good
Presentation of Materials	85%	Very Good
Benefit	85%	Very Good

3.2. *Discussion*

3.2.1. Feasibility of virtual reality-based digital modules assisted by a MOOCS platform

Based on the results of the feasibility test that has been carried out and the results obtained in Table 4, the results of the eligibility criteria from experts are obtained, which is very feasible. This criterion was obtained because in this E-Module, the discussion material is presented in a concise manner in accordance with the learning outcomes in the curriculum currently used, namely the independent curriculum. This E-Module is also equipped with questions for creative thinking exercises and how to assess them. The use of language in this E-Module can also be easily understood as well as the consistent use of scientific symbols or notation. The learning media contained in this E-Module such as explanatory images on each discussion material and learning videos can be easily accessed and have been in accordance with the learning materials presented. This is supported by Syarlisjiawan's research [9] who obtained the results of the feasibility test and validation of the e-module developed are considered "very feasible" to be used based on the assessment of media experts and material experts. E-Module based socio-scientific issues as a form of digital teaching materials that have been systematically arranged so that they can be used for student learning purposes, making it easier for students to learn independently and solve problems using themselves. These results are in line with the feasibility results of the Ajri E-Module [13] which shows that the E-Module developed is easy for students to understand because it can be seen easily and there are clearly arranged instructions for use Thus, the E-Module in this study is needed to be used well in the learning process. Hence, the use of e-modules based on socio-scientific issues can improve the quality of physics learning, which is more interesting.

3.2.2. Improving students' creative thinking skills with e-modules based on socio-scientific issues

The improvement of creative thinking skills can be seen from the learning outcome tests given to students. The results of the analysis show that the N-Gain value obtained is in the high category. Based on Table 5, the creative thinking indicator that obtained the highest N-Gain value was in the flexibility

indicator. This is because the module contains practice questions that refer to creative thinking skills that lead students to be able to explore answers. Students give various answers to the problems in the given test questions. Answers from students on the elaboration creative thinking indicators include students who explain their ideas to make a portable fan using solar energy by utilizing solar energy as an alternative to batteries so that there is no need to replace the battery. In addition, there are also students who give answers to original indicators answering test questions by explaining their idea, namely to create a mini garden equipped with lights. The lamps used are lamps that utilize solar energy with a concept like street lights. Students also gave many answers about creating a power plant as an effort to utilize existing renewable energy such as water, wind, sun and sea waves.

In the learning process, a project-based learning model is used. Students are given illustrations of socio-scientific issues as basic questions before entering the learning material. Then students are given renewable energy materials such as forms of energy, energy sources and examples of renewable energy and non-renewable energy. Furthermore, students are formed into several small groups. Each group was given the opportunity to design the product they made by utilizing existing energy sources. After that, students are given a project making schedule and monitoring the progress of the project making process. The products that have been completed by the students are then presented and then assessed. The results of the products that students have completed can be seen in Figure 5.

Figure 5. Images of products that utilize wind energy sources (left) and images of products that utilize water energy (right).

The image above can be said to be a creative idea because it uses materials with low cost but produces an attractive design. The use of waste is one of the uses of local resources that can be recycled so as to produce good work. The creative idea can be developed as an alternative solution to socio-scientific issues in Bengkulu because the availability of energy sources used is quite abundant.

In line with research conducted by Hoffman [14] That is, students' creativity can be trained by finding problems and coming up with various kinds of ideas. The various ideas from the students are proof of creative thinking in every student and can be trained continuously. The lowest N-Gain is on the smoothness indicator. This is because students have not been able to give the right answers to the questions given. The initial ability possessed by students also affects the creative thinking ability of these students. This is in line with Anna [15] that socio-scientific issues can encourage participation in discussions and debates, provide a framework for understanding scientific content and the nature of science, and aid in the development of HOTS (Higher Order Thinking Skills), such as creative, critical thinking and argumentation. E-module-based socio-scientific issues can improve creative thinking ability of high school students. Presentation of issues socio-scientific issues making students able to develop the creative ideas they have. This is supported by Mubarok's research [16] who obtained results N-gain that occurs increases students' creative thinking at the field test stage (medium category), so that the electronic physics module produces a valid, practical module and an increase in creative thinking. This is in line with Anjiana [17] Creative thinking skills are skills that are shown when students have innovative thinking in producing various possible answers to solve a problem and teachers can help students develop creative thinking skills so that they can learn effectively Students who have creative thinking skills are able to overcome learning challenges and problems, formulate problems creatively, and find original solutions.

3.2.3. Students' Response to E-Modules Based on Socio-scientific Issues to Improve Creative Thinking of High School Students

In this study, it is known that the students' response to the e-module-based socio-scientific issues to improve creative thinking skills of high school students. A very good response was obtained because in the E-Module the display presented such as writings, pictures and descriptions were presented in an interesting way. The presentation of the material in this E-Module has relevance to everyday life. This E-Module discusses the issue of socio-scientific issues which discusses social and scientific issues related to real life so that students feel more interested in learning. The existing practice questions can also improve students' creative thinking. This e-module can be used anywhere and anytime and can be useful for students in understanding the learning material. Because it is presented with an illustration of the issue socio-scientific issues at the beginning of each learning activity. The results of this study are in accordance with the theory of behavioral learning. Behavioral learning theory is a learning theory that prioritizes changes in student behavior as a result of stimuli and responses. According to Skinner [18] that the relationship between stimulus and response occurs because it is through interaction with the environment which then causes behavioral changes. This is in line with [19] Teaching materials presented with a pleasant presentation can improve student competence. Tangible evidence of the development of E-modules based on socio-scientific issues It is useful in providing teaching materials and helping students learn independently without forgetting the goals of learning outcomes contained in the independent curriculum, namely creative thinking. This is supported by Yuyun et. al. research [20] who obtained very interesting category results. Therefore, it can be concluded that the E-Module developed in this study is very good and very interesting to use in physics learning.

4. Conclusion

Based on research on the development of e-modules based on socio-scientific issues to improve the creative thinking of high school students, it can be concluded that the E-Module that has been validated by experts is declared very feasible to use. Based on results Pretest and Posttest that e-modules are based on socio-scientific issues to improve creative thinking ability of high school students obtained an N-Gain score with a high category so that this E-Module can be used to see students' creative thinking skills. The students' response to the use of this E-Module is very good. The next suggestion for researchers is to be able to develop E-Modules based on socio-scientific issues This is on other physics subject matter and can develop issues socio-scientific issues without limitation only in the Bengkulu area.

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