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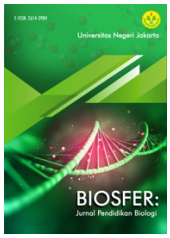

Development science modules interactive of shared type to increase reading interest and concept understanding

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ABSTRACT

This research and development aims to produce shared-type interactive e-modules on energy sub-materials and energy sources. The e-module development model uses ADDIE by integrating energy transformation materials, energy applications in living things, as well as energy source-forming compounds. In field trials, using a type of pre-experiment research with a one-group pretest-posttest design. This research was carried out at SMPIT Bakti Insani class VII with saturated sampling technique. The data collection technique uses essay questions to find out the results of understanding the concept and a likert scale questionnaire to find out the results of reading interest. The data analysis technique uses a paired T test with the aim of seeing the significance of the e-module to reading interest and concept understanding and the n gain test to see an increase in the value of reading interest and concept understanding. Based on theoretical feasibility tests by experts, an average of 40.4 with excellent categories and empirical feasibility tests by students were 63.75 with excellent categories. Based on the development and research, it can be concluded that 1) the shared type interactive science e-module product is feasible to use with an excellent category; 2) the shared type interactive science e-module affects the interest in reading and understanding concepts with a significance of 0.000; 3) the shared-type interactive science e-module is able to increase reading interest by 0.52 with medium category and increase understanding of concepts 0.81 with high category.

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INTRODUCTION

In 2021, the Ministry of Education and Culture changed the national examination (UN) to the national assessment (AN) to meet the demands of the 21st century (Purwati et al., 2021). One type of test from the national assessment is to take the minimum competency assessment (AKM) where the type of test consists of numeracy literacy and reading literacy. However, during the implementation of the simulation, students experienced difficulties in doing the reading literacy test because they were presented with a long reading text with a relatively short time. In addition, based on the national literacy index by the Ministry of Education and Culture, 71% of the Indonesian population has low literacy activity. As a result of the 2018 world PISA score, Indonesia was ranked 71 out of 77 countries, with a reading literacy score of 371.

In recent years, in various schools there have been "school literacy movement (GLS)" activities, but these activities have not been able to run optimally. The factor is that students are less interested and some even do not want to read at all. In addition, reading materials in schools are limited and only less interesting hard file books are available. This is supported by research (Ramandanu, 2019) that the implementation of the school literacy movement (GLS) for 15 minutes before learning begins experienced several obstacles such as the environment and facilities and infrastructure that were not supportive. In order for students to have good reading literacy, a habit is needed that supports it, such as the cultivation of the character of interest in reading. One of the factors influencing the low interest in reading is the lack of motivation both in terms of reading and the encouragement of people around (Rohim & Rahmawati, 2020).

The character of interest in reading is a character where a person has an interest in an activity to add new information and knowledge (Sari et al., 2020). Interest in reading is an awareness that is carried out with a sense of pleasure and is usually supported by an adequate environment (Tarigan, 2018). If a person has a character of interest or habit of liking to read high, it will be easy to get benefits in him such as an abundance of knowledge, sharpening memory, enriching vocabulary, building self-confidence, creativity, and discipline. If a person has a high interest in anything, then he tends to understand something, for example understanding the concept (Mulyaningsih, 2021).

Conceptual understanding is the ability to find knowledge independently through various processes such as assimilation and accommodation. The existence of this process can make a person feel dissatisfied with existing concepts, so that he digs deeper into information (Bahri & Adiansha, 2020). Understanding of concepts is important in science learning. Through a good understanding of concepts, students will be able to explain phenomena scientifically and apply a concept in a real and contextual manner to solve existing problems (Wulandari et al., 2023). In fact, the understanding of concepts in science subjects is low in one school reaching 50% (Rahmaniati & Samsudin, 2023; Rahmawati et al., 2023). Factors that can influence the understanding of concepts are student conditions, environment, learning approaches that include everything in learning activities ranging from strategies, methods, devices, and so on (Suendarti & Hasbullah, 2020). According to the level of cognitive processes of comprehension, the indicators of concept understanding consist of interpreting, exemplifying, classifying, summarizing, interfering, comparing, and explaining (Zakiah & Tatang, 2019). Conseptual understanding is closely related to material in science learning.

Natural phenomena are taught in science classes and are described in terms of facts, ideas, guiding principles, and theories that come from the scientific method (Fahlevi et al., 2022). In the science curriculum, content relating to concepts, ideas, models, and scientific theories is well defined, although some variations may be permitted or encouraged to allow students to pursue specific interests. If the learning objectives aim to produce a certain conceptual understanding, the nature of the learning must be clearly explained to the students, so that the students obtain the results that can be expected (Hodson, 2014).

To minimize the problems above, supporting teaching materials are needed, that supports one of which is an interactive e-module. This is in line with the research of Rahmadana, et al that the application and development of ARIAS-based e-modules can improve students' understanding of concepts (Rahmadana et al., 2020). The interactive e-module is a science module that contains natural science materials that are attractively packaged and accompanied by images, videos, and even audio. According to (Depdiknas, 2017) The e-module should pay attention to the willingness of the device as well as the size of the display. In general, modules have the characteristics of self instructional, self contained, self-alone, adaptive, and user friendly so that learning can be done independently and meaningfully

(Shofiyah & Al-muhdhar, 2021). To make learning more meaningful, researchers integrate material with a shared type of integration. The type of shared Integration used to combine science materials, both from the fields of physics, chemistry, and biology. The developed E-Module facilitates reading interest and concept understanding, where the developer emphasizes the quantity of reading resources according to reading interest indicators, the existence of authentic examples that make it easier for students to state a concept and increase reading interest.

According to the Ministry of Education and Culture, natural science subjects in Middle school are packaged in an integrated manner. However, it is not uncommon to find that science learning is still often separated into two sub-lessons, namely physics and biology. The shared integration type is a combination of at least two sub-materials and even two subjects with the main slice of concepts. One of the science materials that applies the integration of physics, chemistry, and biology is energy. The integration of energy matter can include energy transformation sub-matter, energy applications in living things, and compounds forming energy sources.

Based on the background description above, an article title was obtained "Development of a shared type interactive science E-module to increase interest in reading and understanding concepts". This article discusses 1) the development of a shared-type interactive science e-module; 2) the influence of shared-type interactive science e-modules on reading interest and concept understanding; 3) increased interest in reading and understanding concepts before and after the implementation of the shared type interactive science e-module.

METHODS

Research Design

The research method used is research and development (RnD). The development model used is ADDIE (analyze, design, develop, implement, & evaluate) which can be seen in figure 1. The ADDIE model can be used for the development of learning materials in the verbal realm, such as e-Modules. In addition, the ADDIE model is also often used to describe development in a systematic and instructional manner (Branch, 2009). In field trials, using a type of pre-experiment research with a one-group pretest-posttest design.

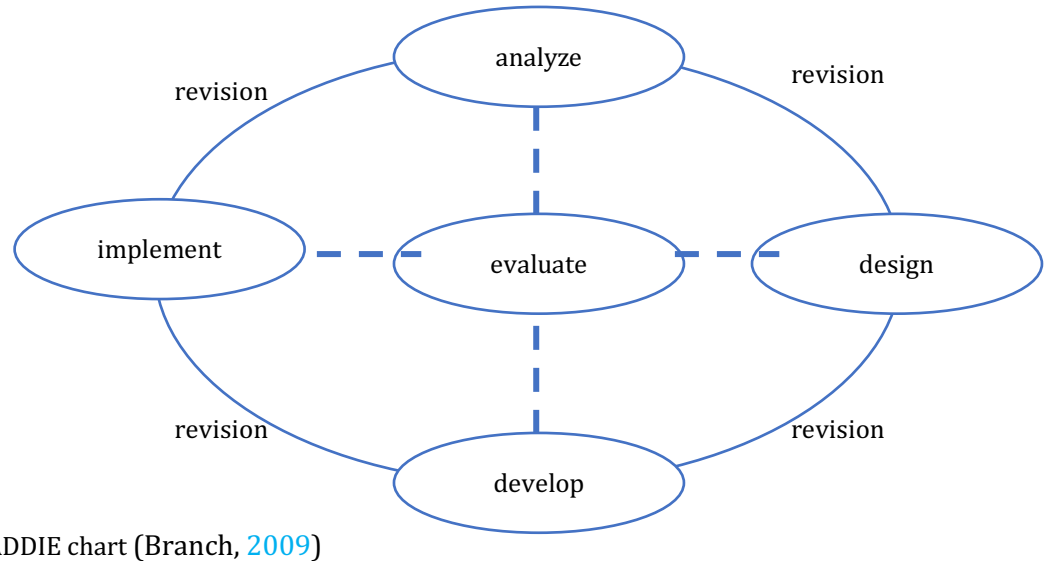

Figure 1. ADDIE chart (Branch, 2009)

Population and Samples

The population of this study is one of the Islamic middle schools in the city of Yogyakarta. The sampling technique uses cluster sampling in class VII which consists of 12 students. The selection of the type of cluster is due to the limited number of students so that they cannot choose a sample at random.

Instrument

The instrument for collecting data is in the form of theoretical and empirical e-module assessment questionnaires, reading interest questionnaires, and concept understanding questions. The reading interest questionnaire is arranged using a likert scale with a category of four answer choices. While the concept understanding test is prepared with three indicators consisting of six essay questions.

Procedure

At the **analysis** stage, Researchers analyze problems in learning such as lack of interest in reading students and low understanding of concepts in science subjects. In addition, at this stage a needs analysis is also carried out by conducting preliminary studies by observing students' interest in the books used, as well as analyzing the concepts of the material that will be used in training reading interest and understanding concepts. Based on the analysis of the material carried out, researchers looked for integration in energy sub-matter and energy sources. After analysis, the material contains several concentrations in the fields of science, both physical, biological, and chemical sciences, so the researcher decided to use the type of integration shared with the slices of sub-matter energy applications in living things which can be seen in figure 2.

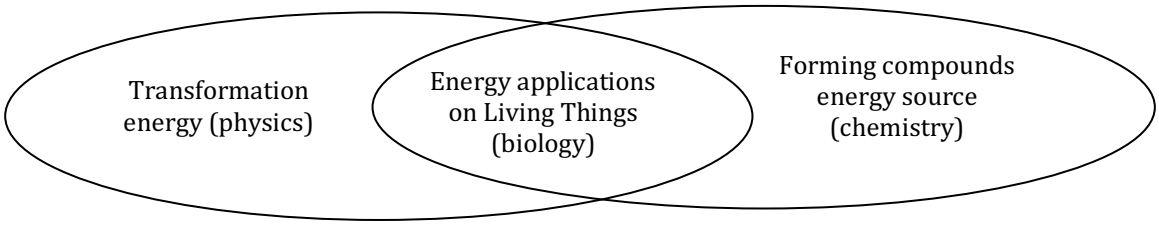

Figure 2. Shared chart

At the **design** stage, researchers design and plan the creation of an e-module that is used to solve existing problems. The design stage starts from preparing layouts, images, audio, video, even in the selection of fonts and colors. In the **develop** stage, the researcher compiled a draft e-module "energy in life" and a validation sheet. Once the draft e-module is composed and all the needs are in place, the researcher turns the draft into an interactive electronic module. The application used to change it is kvisoft flipbook maker pro and is published using html 5 format. Furthermore, the product is expertly validated. Expert validators in the field of science materials and media validators who are experts in the field of IT. This is because the e-Module is electronic so it requires IT experts in the validation process. The e-module is tested for feasibility including aspects of content and material, language, presentation, as well as aspects supporting the character of reading interest and interest in learning empirically assessed by learners in limited trials. After a module is declared valid by validators, it is piloted on a limited basis to determine the readability of the e-module.

At the **implementation** stage, The module was piloted to grade VIII students in one of the Middle schools in Yogyakarta. After the limited trial stage is completed, the e-module reaches the **evaluation** stage, the e-module is carried out data analysis and provides comments and suggestions from theoretical and empirical assessors.

Data Analysis Techniques

Data analysis techniques use analysis theoretically and empirically. The results of theoretical and empirical assessments are converted according to the provisions of the normal curve. After the score $\bar{X} = \frac{\sum x}{n}$ is calculated then the results of the 11 statements are converted using a scale of 5 as in Table 1.

Table 1.
Theoretical feasibility test assessment criteria

Score range	Category
$37{,}4 < X \leq 44$	Excellent
$30{,}8 < X \leq 37{,}4$	Good
$24{,}2 < X \leq 30{,}8$	Good enough
$17{,}6 < X \leq 24{,}2$	Bad
$11 \leq X \leq 17{,}6$	Very bad

Meanwhile, the conversion of the results of the 19 empirical feasibility test statements can be seen in Table 2. while the results of the research instrument were analyzed using paired T-tests to see the influence before and after the application of the shared type interactive e-module. This is because it does not meet one of the requirements of the manova test. As for the before and after improvement, the results are analyzed using the N-gain score on each indicator.

Table 2.
Empirical feasibility test assessment criteria

Score range	Category
61,2 < X ≤ 72	Excellent
50,4< X ≤61,2	Good
39,6< X ≤ 50,4	Good enough
28,8< X ≤ 39,6	Bad
18≤ X ≤28,8	Very bad

RESULTS AND DISCUSSION

Product development is carried out based on ADDIE stages, namely analyze, design, develop, implement, and evaluation. At the analysis stage, an analysis of product development needs is carried out, starting from student analysis, curriculum analysis, task and material analysis. Based on interviews with science teachers, one of the obstacles in learning science is the lack of understanding of students towards science concepts. This is because the textbooks provided are less attractive. In addition, learners are less accustomed to reading long texts. Furthermore, an analysis of the curriculum is carried out by studying the Core. Basic Competencies and Competencies of Science subjects in Class VII Middle School, then a selection of basic competencies to be used for development products is carried out, namely basic competencies 3.5 Analyzing the concept of energy, various energy sources, and changes in energy forms in everyday life.

At the design stage, researchers create outlines, write materials, design covers and module contents in the Canva application in pdf format. The pdf results are converted to html form via heyzine flipbook. This is so that the e-module is easy to use anywhere and anytime, both through mobile phones and computers. The development of a shared-type interactive e-module serves to support learning with the aim of increasing the interest in reading and understanding the concepts of students. This e-module is packaged in an integrated manner by relating physical, chemical, and biological sub-materials. What makes this e-module interesting is that the e-module contains music audio, so that someone who has an auditory learning type can increase the volume of their music, but if you don't like music, you can reduce the volume of the music. In addition, in this e-module, several interactive videos related to energy matter and energy sources are also inserted. So that the material is interesting and filled with material with language that is easy to understand for middle school. Based on the results of product development, theoretical and empirical feasibility tests are carried out. The results of the theoretical assessment can be seen in Table 3.

Table 3.
The average result of the science e-module assessment score

Assessment indicators	Average score
Contents and materials	14.6
Language	10.8
Feasibility	15.0
Average	**40.4**

Based on the information in Table 3, the assessment of content and material obtained an average grade of 14.6 (A) with a very good category and the presentation aspect with an A grade in the very good category. This shows that this energy material electronic module is easy to use in science learning. The ease of using this e-module allows students to learn the module independently. Based on the initial product assessment, the shared type interactive e-module is already very good and worth using. However, the researcher conducted the evaluation stage and there are several notes that must be corrected as stated in Table 4.

Table 4.
Comments and suggestions of the initial assessment test of science e-module

Comments and suggestions	Follow up
Less neat fonts	Tidying up less neat fonts
Background coupled with science-related images	Add some science-related images

The developed module underwent revisions to the letters and drawings. Validators say that images related to energy matter can facilitate learners' understanding of concepts. In addition, images can also illustrate and translate information that is easier for students to understand. Therefore,

revisions to add drawings in electronic modules are important. After improvements and follow-ups on validator comments and suggestions, the e-module can be tested. The results of the feasibility test also say that the material is very interesting and easy to understand so that it can meet the supporting aspects of the character of reading interest and understanding of material concepts. After the theoretical feasibility test stage of the product and the first evaluation, the researcher conducted an empirical feasibility test to the participants and re-evaluated it. The average results of the student response score to the shared type interactive e-module can be seen in Table 5.

Table 5.
Average initial response of learners to the shared type interactive science e-module

Assessment indicators	Average score
Contents and materials	22.37
Language	20.25
Feasibility	21.12
Average	**63.75**

Based on initial product trials, the science e-module is already well used but there are some comments that should be improved, as shown in table 6.

Table 6.
Comments and suggestions on learners' initial responses to the science e-module

Comments and suggestions	Follow up
Image layout is not quite right	Fix the image layout
The font used is too thin	Bold some fonts that look thin

After passing two revisions, the following view of the shared type IPA e-module can be seen in Figure 3.

Figure 3. Science modules Interactive of Shared Type display

At implementation stage, extensive trials were conducted to see the influence of e-modules on students' reading interest and understanding of concepts. Interest in reading is an activity of a person who is able to encourage reading activities over and over again so as to give strength to memory. The results of the trial on reading interest obtained the results of a descriptive analysis of the pretest and posttest values of reading interest can be seen in Table 7.

Table 7.
Descriptive analysis of reading interest

Information	Pretest	Posttest
Mean	71.88	86.46
standard deviation	3.77	3.61
Minimum value	62.59	81.25
Maximum value	78.13	93.75

Interest in reading has several indicators such as reading pleasure, benefit awareness, frequency of reading, and the number or quantity of reading sources (Sari, Gunawan, Fitriyani, & Hilaliyah, 2020). The results of the analysis on each indicator of reading interest can be seen in table 8.

Table 8.
Average reading interest score per indicator

Indicator	Average		N-gain	Infromation
	Pre-test	Post-test		
Benefit awareness	73.96	88.54	0.56	Medium
reading pleasure	73.96	85.42	0.44	Medium
frequency of reading	66.67	84.38	0.53	Medium
quantity of reading sources	72.92	87.50	0.54	Medium
Average	71.88	86.46	0.52	Medium

Based on the analysis of each indicator, an N-gain was obtained from an average total of 0.52 with a moderate category. The results of the reading interest questionnaire analysis, on the benefit awareness indicator, got the largest n-gain value, which was 0.56. This is because e-modules are associated with everyday concepts, so that learning is more meaningful and there are many benefits and knowledge that can be taken. Meanwhile, the reading pleasure indicator got the lowest n-gain value, which was 0.44. This is because students are just beginning to adapt to refract the love of reading. The results of the reading interest questionnaire say that if the e-module is packaged interestingly and interactively, then students will prefer to read, read more often, and even increase the amount of reading material, especially science material, rather than just doing activities that are less useful. In order to know clearly, the learner's individual reading n-gain diagram can be seen in figure 4.

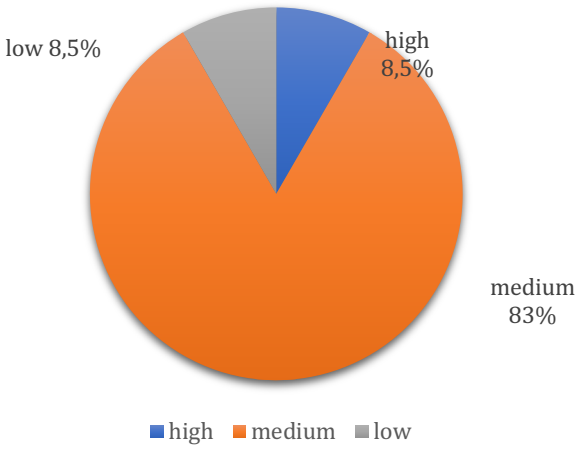

Figure 4. Graph N-gain reading interest.

Based on table and Figure 4, the average reading interest score on posttest was 86.46 with a very high category. Meanwhile, based on the results of the n-gain analysis of individual reading interest, 83% of students experienced an increase in reading interest in the moderate category. The results of the normality test obtained results of more than 0.05, so that the data was normally distributed. Based on the results of the T test of paired samples, a significance value of 0.000 < 0.05 was obtained, then H0 was rejected, meaning that there was a difference in the value of interest in reading before and after the application of the shared type interactive e-module. E-modules can increase interest in reading because the content of the module is adjusted to the indicators of reading interest, such as e-modules packaged more attractive, interactive, easy-to-understand language so that indirectly the awareness of benefits, enjoyment of reading, frequency of reading, and quantity of reading resources of students will increase. This is supported by research (Tarigan, 2018) that the selection of interesting reading materials and containing positive elements equipped with interactive media is able to arouse children's attractiveness, so as to increase students' interest in reading. In addition to interest in reading, this e-module also aims to find out its influence and improvement on the understanding of concepts. Concept understanding is an ability to re-express an idea, concept, idea and be able to communicate it well (Pantiwati et al., 2022). The results of concept understanding get the results of a descriptive analysis of the value of understanding concepts can be seen in Table 9.

Table 9.
Descriptive analysis of concept understanding

Information	Pretest	Posttest
Mean	66.32	93.58
standard deviation	10.73	3.92
Minimum value	47.92	87.50
Maximum value	83.33	100.00

A person can be interpreted as understanding if he is able to absorb and understand the material easily so that learning is more meaningful. In this study, the mean of the posttest understanding of the concept got a score of 93.58 with an excellent category. Thus, it means that students can do the problems of understanding the concept of energy and energy sources well and meaningfully. In this study, the indicator of understanding the concept used is to re-state a concept, give examples, and make conclusions where the value in each indicator can be seen in Table 10.

Table 10.
Average concept understanding score per indicator

Indicator	Average		Ngain	Information
	Pre-test	Post-test		
Reproducing a concept	73.96	93.23	0.74	High
Giving examples	62.50	94.79	0.86	High
Estimating/ making conclusions	62.50	92.71	0.81	High
Average	66.32	93.58	0.81	High

Based on table 10, the results of the improvement give an example superior to others. This is because the module provides examples of energy applications in everyday life, both in videos, images, and text. Indirectly, these things will be recorded in the brain so that students can absorb learning easily and can analyze indicator questions to provide examples with excellent categories. Meanwhile, the indicator states that a concept gets the lowest improvement results compared to others. This is because students have difficulty rewriting the concepts that have been obtained in written form. When viewed from the improvement in understanding of individual concepts, almost all students (67%) students get n-gain scores with high categories. For more details it can be seen in figure 5.

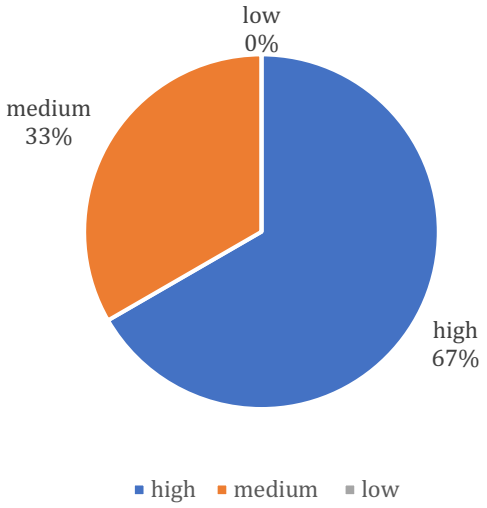

Figure 5. Graph N-gain concept understanding.

In addition to being analyzed using n-gain, the results of the pretest and post-test of understanding the concept were carried out normality tests and obtained results of <0.05 so that the data was distributed normally. Measurement of the results of understanding the concept is carried out by comparing the results of the pretest and posttest. Based on the results of the T test of paired samples, a significance value of 0.000<0.05 was obtained, then H_0 was rejected, meaning that there was a difference in the value of understanding the concept before and after the application of the shared type interactive e-module. In addition, the difference is also attributed to the n-gain value which shows a result of 0.81 with a high category.

According the research (Widiastuti, 2020) the selection of supporting teaching materials such as contextual-based with the Tri Hita Karana concept is able to increase understanding of the concept. The understanding of concepts is related to the theory of constructivism that in a process students are able to build their knowledge based on what they have read so that students have freedom of thought and issue ideas (Suciati & Lestari, 2018). In this case, the shared type interactive science e-module has five characteristics that are very helpful in shaping the understanding of students' concepts. This e-module also contains visual and audivisual which can increase student understanding and stimulate student thinking (Baga et al., 2022).

In essence, modules can be an alternative to solving student problems independently, if accompanied by guidelines and instructions to achieve the competencies achieved. In addition, the development of this module is accompanied by hypertext that can be accessed online and can facilitate development with innovative message delivery techniques, for example using an adaptive learning-based approach (Aslik et al., 2022). The advantage of emodules compared to print modules is that they are interactive, making it easier to navigate, allowing displaying or loading images, audio, video and animation as well as formative tests or quizzes (Azizah et al., 2022). Based on the research that has been done, the e-modules that have been developed can train the understanding of concepts and reading interests of middle school students. This is because the modules developed are interactive so that students are not easily bored and want to always read it.

CONCLUSION

Based on the results of research and development, it can be concluded that 1) the products produced are Science modules Interactive of Shared Type; 2) the results of the assessment by the team of experts and students show that the average categorized assessment is very good; 3) there is an influence of the shared type interactive science e-module on reading interest and understanding of concepts with a significance of 0.000; 4) the results of the application of the shared type of interactive science e-module are able to increase the interest in reading and understanding the concepts of class VII students of middle school. Due to time constraints, this research was only conducted once so that the utilization of e-modules was not optimal. Future research can be carried out at least three meetings. In addition, the primary data obtained in reading interest is in the form of Likert scale questionnaires, in the future trials can be carried out with the IP scale to minimize perspective answers from students.

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