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Development of Hots-Based Interactive Learning E- Media in Primary School Science Learning in The Kudus

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Abstract: This study aims to analyze the needs of learning media, formulate the development of learning media design, analyze the feasibility of learning media, and analyze the effectiveness of interactive learning media based on HOTS SD 1 Colo Kudus Regency. The development of HOTS-based interactive learning media also aims to improve students' ability to think higher order in the science subject Theme 1 Animal and Human Motion Organs. Interactive learning media is a multimedia-based learning media that causes interaction that makes learning more meaningful, efficient, and learner-centered motivation. While the ability to think higher order or Higher Order Skill (HOTS) is a way to set provisions and solve problems in new situations by confronting, manipulating, and modifying the knowledge and experience already possessed to think critically and creatively. HOTS-based interactive learning media answers the needs of current learning media, the design of learning media is feasible and effective to be used in learning, so as to improve science learning outcomes of elementary school students. The research method is R&D (Research and Development). The research method uses research and development produced in the form of HOTS-based interactive learning media. This research uses seven steps, namely: 1) potential and problem analysis, 2) information collection, 3) product design, 4) design validation, 5) design revision, 6) product trial, and 7) product revision. The research was conducted through 4 activities, namely: (1) analyzing teaching materials, (2) developing teaching material designs, (3) the feasibility of teaching materials used, and (4) the effectiveness of using teaching materials. The product trial design uses pretest posttest control group design on students at SD 1 Colo as an experimental class and students at SD 1 Kuwukan as a control class. Data was collected by interviews, questionnaires, tests, and documentation. Data were analyzed by accumulating the number of scores Data on the effectiveness of HOTS-based interactive learning media were analyzed by gain test, t test at a significance level of 0.05.

Keywords: Interactive Learning Media, HOTS, Elementary School

1. Introductions

The government through the Ministry of Education and Culture has issued regulation Number 37 of 2018 concerning Core Competencies and Basic Competencies for Lessons in

the 2013 Curriculum in Basic Education and Secondary Education. This Permendikbud is to answer the challenges of the times that previously existed, to amend and perfect Permendikbud Number 24 of 2016. To answer the challenges of the times, it is necessary to change the K-13 implementation regulations. One of them is the need to pursue 21st Century skills. Bishop (2006) suggests 21st century learning orientations in the form of various 21st century skills that are important for students to master in order to become creative, productive citizens and people in the 21st century. The challenges of the 21st Century are characterized by an abundance of information Technology. Changes in technology and information nowadays, apart from bringing benefits to human life, but on the other hand can also bring problems to humanity if they cannot be managed wisely.

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Technological advances require humans in the 21st Century to be able to adapt to science and technology, have superior human resource (HR) capabilities and have competitive abilities and have high-level thinking skills. John Dewey stated that higher level thinking is essentially an active process, where a person thinks about things in depth, asks various questions, finds relevant information rather than passively waiting for information (Fisher, 2009). Critical thinking is a process where all knowledge and skills are deployed in solving problems that arise, making decisions, analyzing all assumptions that arise and carrying out investigations or research based on the data and information that has been obtained so as to produce the desired information or conclusions. To be able to train to improve students' ability to think at a higher level, it is necessary to provide a variety of questions that vary according to basic competencies with a HOTS (Higher Order Thinking Skills) orientation. If HOTS questions are used to being given by students, then indirectly students are used to developing their thinking processes. The reality in schools is that students are not used to being trained to solve problems that require high-level thinking.

The absence of widespread outreach and training to teachers means that not many teachers are able to develop HOTS questions. SD 1 COLO is one of the elementary schools in Dawe District, Kudus Regency. Based on the learning results of learning evaluation tests related to questions that require students to think at a high level in formative tests, they are still not satisfactory, in fact there are still many students who get scores below the school's KKM. One of the causes of students' low level of high-level thinking ability is that the learning media used by teachers for students in delivering learning is less able to motivate students and only tests knowledge and understanding. In the learning activities provided by the teacher during the learning process, students still test students' low-level thinking abilities (Low Order Thinking Skill). Teachers' ability is lacking in developing learning media that trains children to think at a high level / High Order Thinking Skill (HOTS) and there are no special tests to train and test HOTS so that students are not trained enough to work on questions that measure high level thinking abilities. Based on the problems above related to learning outcomes tests, to determine students' high-level thinking abilities, they need to create interactive learning media for the tests used. Apart from developing interactive learning media, solutions can be used to train students to be able to develop the thinking abilities that exist within their own potential. This ability is in learning and compiling learning media, not only memorizing lesson material and memorizing lessons but developing interactive learning media based on HOTS questions.

Changes in science and technology are currently developing very rapidly. Very fast changes occur because developments in science and technology can make it easier for humans to carry out their duties and interests. Due to current technological changes and developments, website-based applications are one solution in the process of measuring high-level thinking skills. The use of technology can help teachers' work in measuring and providing assessments of students with faster, better and more efficient work. Apart from that, it is supported by the existence of school facilities such as adequate internet connections, the use of gadgets and chromebooks, making it an opportunity for researchers to develop interactive media based on chromebooks to improve high-level thinking abilities (HOTS).

Seeing the importance of media in measuring the achievement of high-level thinking, researchers were encouraged to conduct research entitled "Development of HOTS-Based Interactive Learning E-Media in Elementary School Science and Science Learning in Kudus Regency".

1.1 Conceptual Framework

Learning activities in the current independent curriculum are recommended to apply technology. The use of technology in the learning process can increase students' learning motivation (Alimuddin et al., 2023; Panggabean & Hidayat, 2022; Zulfitria, 2020). Learning activities will be more meaningful if the source of teaching materials and learning models are to students' needs. The application of technology in learning activities can take the form of using e-modules (Leny et al., 2021). Based on this data, researchers plan to create an learning media . The learning media being developed will be based , on the content of IPAS stage B.

In this development research, researchers used Sugiyono, (2019) Borg and Gall model, the research and development steps are: (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) initial trial; (7) product revision.

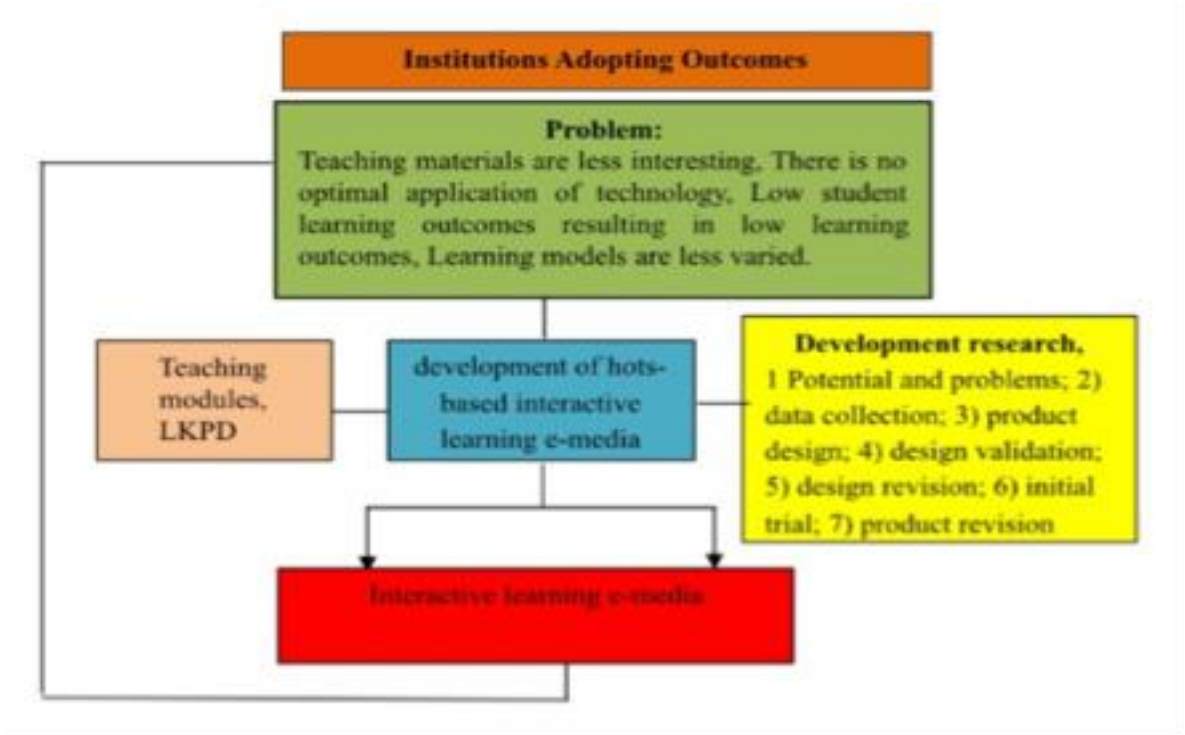

Figure 1. Conceptual Frameworks

1.2 Research Objectives

Describe the need for HOTS-based Interactive Learning E-Media in Science and Technology Learning in Elementary Schools, Determine and create a HOTS Interactive Learning E-Media design for Social Science Learning in Elementary Schools. Describe the feasibility of HOTS-based Interactive Learning E-Media in Social Science Learning in Elementary Schools., Analyze the effectiveness of HOTS-based Interactive Learning E-Media in Social Science Learning in Elementary Schools.

2. Methodology

2.1 Research Design

The design applied in this research is R&D development which has the aim of developing a product and testing the effectiveness of the product through certain procedures and steps (Fransisca et al., 2019). The product developed is an e-module based on problem- based learning containing local wisdom and science material. The development model applied is Borg and Gall which has 10 stages (Sugiyono, 2017). However, e-module development only uses 7 stages, these research and development stages are: (1) potential and problems; (2) data collection; (3) product design; (4) design validation; (5) design revision; (6) initial cob test; (7) product revision (Borg, R.W. & Gall, 2007).

2.2 Respondents of The Study

The respondents of this research were three elementary school teachers,. Grade 5 students at three elementary schools. and media, language, and linguistics experts from Muria Kudus University. The sampling technique used in this research was simple random sampling. simple random sampling, namely taking samples randomly without paying attention to strata so that all populations have the same opportunity (Sugiyono, 2018).

The research instruments applied in this research were interview instruments, tests, student and teacher teaching material needing a total of 25 questions, validation instruments for teaching material experts and material experts, as well as teacher and student response instruments. Questionnaires were given directly to teachers, students, and experts.

Table 1. Description of the average e-module assessment

Achievement Level	Category	Information
81% - 100%	Very good	Very valid/very worthy/not revised
61% - 80%	Good	Valid/eligible/not revised
41% - 60%	Enough	Valid enough/quite worthy/revised
21% - 40%	Not enough	Invalid/inadequate/requires revision

3. Findings and Discussion

3.1 Result

Research results consisting of (1) the need for Hots-Based Interactive Learning E-Media, (2) the design of Hots-Based Interactive Learning Media, (3) the feasibility of Hots- Based Interactive Learning Media, (4) the effectiveness of Hots-Based Interactive Learning E-Media in the learning process to improve science and science learning outcomes regarding the properties of light for Class V Elementary School students.

Students need new methods to improve science learning outcomes with Hots-Based Interactive Learning E-Media. Indicators of interest in learning media were 5% of students gave a score of 2, 40% of students gave a score of 3 and 38% gave a score of 4. Meanwhile, for indicators of understanding of the material, some students gave a score of 2, 7% gave a score of 3 and 48% gave a score of 3. 4. On the display indicator, 9% of students gave a score of 2, 38% of students gave a score of 3 and 52% gave a score. In terms of media presentation indicators, 4% of students gave a value of 2, 43% gave a value of 3 and 54% gave a value of 4. It was concluded that this media is really needed by students in improving science learning outcomes.

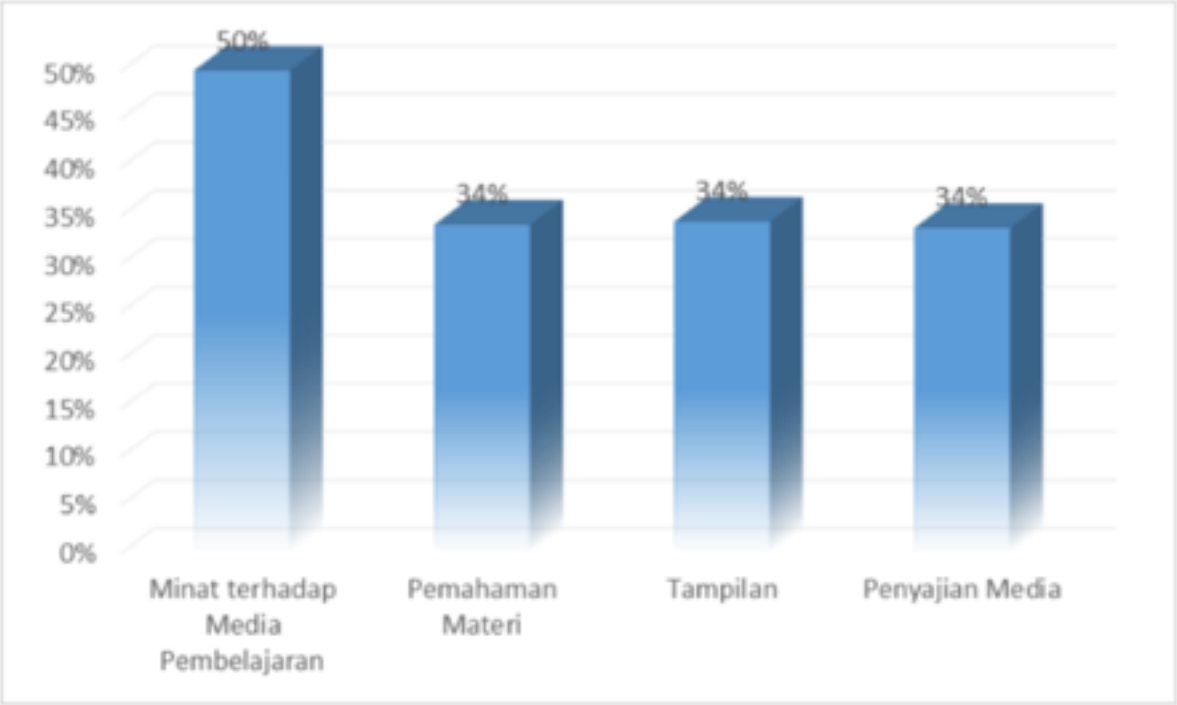

Figure 2. Student learning outcome

The media design aspect indicator (Cover) has a quality of 96% with very good criteria and has very Valid/very feasible/not revised information, on the media design aspect indicator there are 97% opinions with very good criteria with the description value very Valid/very feasible/ not revised, and the visual communication aspect (the display has a presentation attractiveness of 88% with very good criteria with the description very Valid/very feasible/not revised. So it can be concluded that the quality of the Hots Based Interactive Learning E-Media as a result of the development is reviewed from the results of expert validation 1 person overall is in the very good or feasible criteria and is ready to be tested.

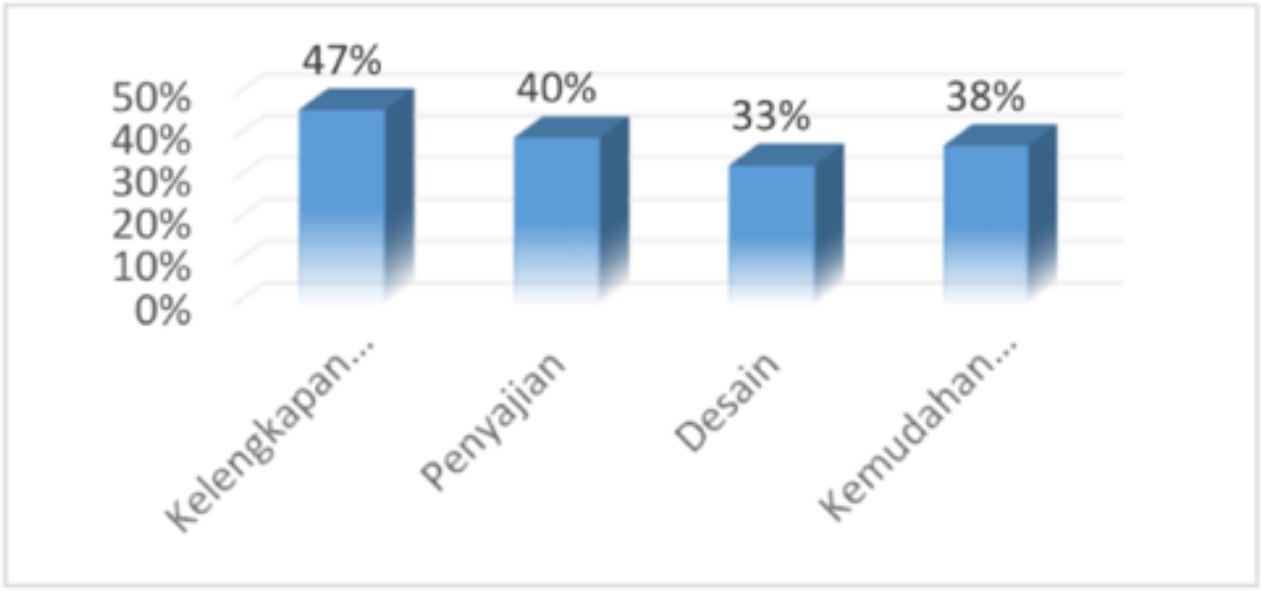

Figure 3. Expert validation

Effective learning media improves student learning outcomes, shown by the 20 students who took the pre-test, only 6 people were in the criteria for learning completeness with an average grade score of 68 and the percentage of learning completeness reached 30%, while of the total number of 20 students who Following the post test, there were 17 students who met the completion criteria with an average score of 86.5 with a completion percentage of 85%. From this data, it can be concluded that after implementing Hots-Based Interactive Learning E-Media, student learning outcomes have increased with moderate criteria in the n-gain calculation of 0.6.

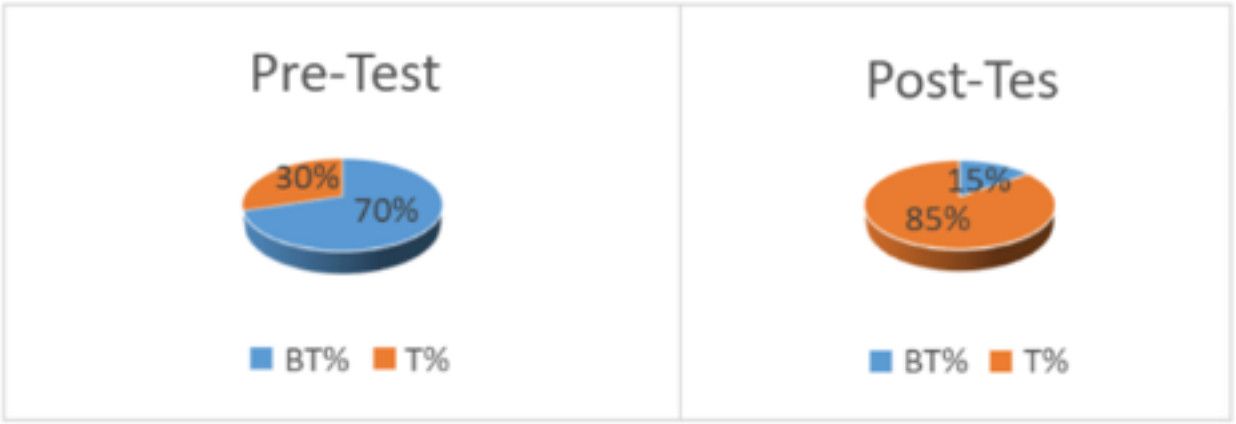

Figure 4. Pre and Posttest Score

3.2 Discussion

Needs related to the development of Hots-Based Interactive Learning E-Media from the needs analysis explained that students' needs for Hots-Based Interactive Learning E-Media are to improve science and science learning outcomes for fifth grade elementary school students. There are 20 students consisting of 12 male students and 8 female students who use the independent curriculum. Analysis of the needs according to students on Hots-Based Interactive Learning E-Media is a new method for helping students to improve their science learning outcomes. Indicators of interest in learning media were 5% of students gave a score of 2, 40% of students gave a score of 3 and 38% gave a score of 4. Meanwhile, for indicators of understanding of the material, some students gave a score of 2, 7% gave a score of 3 and 48% gave a score of 3. 4. It is concluded that this media is really needed by students in improving science learning outcomes. Based on the data bar diagram above, it shows that the interest indicator for learning media is 28%, the indicator for understanding the material is 30%, while the display indicator is 33%, and media presentation is 34%. Based on the data above, it shows that the data instrument used for students' needs in improving science and science learning outcomes for fifth grade elementary school students has the Valid category. It can be seen from the R-Count value which is greater than R-Table, so it can be concluded that the instrument is suitable for use to meet students' needs in improve learning outcomes.

Hots-Based Interactive Learning E-Media to improve science and science learning outcomes for Class V Elementary School Students, useful for assisting teachers in finding new innovations to make learning easier for students. Judging from the diagram data above, it shows that the total percentage of the completeness of presentation indicator is 47%, teachers are concerned about the importance of appropriate completeness of presentation in media development, the presentation indicator is 40%, teachers understand the importance of presenting appropriate media according to students' needs in improving learning, the design indicator is 33 % of teachers understand the importance of creativity in making good and attractive designs so that students can be more interested in understanding the material, and the indicator of ease of use is 38% of teachers need to understand the use and use of each media created so that it is right on target and meets the objectives. Looking at the data above, it can be seen that the Crombach's Alpha value is 0.981, which means it is greater than 0.6. The results of the expert validation test analysis which can be seen from the table above show that the media design aspect indicators have a quality of 96% with very good criteria and have very valid/very appropriate/not revised information. On the media design aspect indicators there are 97% opinions with very good criteria. good with the description value very Valid/very worthy/not revised, and the visual communication aspect of the display has the attractiveness of the presentation as much as 88% with very good criteria with the description very Valid/very worthy/not revised. So it can be concluded that the quality of the Hots Based Interactive Learning E-Media as a result of the development in terms of the results of expert validation from 1 person as a whole is in the criteria of very good or feasible and ready to be tested. So it can be concluded that the material used for this media is appropriate and validated. The results of the analysis of validity tests on expert validation instruments taken by 10 respondents with a total of 25 items to fulfill the needs for developing Hots-Based Interactive E-Media media to improve science learning outcomes for Class V Elementary School Students. Reliability test analysis results on expert validation instruments with 10 respondents and 25 question items, with a Cronbach's Alpha value of 0.744 which states that this value is greater than 0.6.

The third stage is the feasibility of developing learning media used to improve student learning outcomes in the questionnaire. The validity of the question instrument's validity also needs to be tested to find out whether the results of the questions are feasible or not. The data above can be seen that as many as 7 respondents with each score according to the calculations have practical criteria, and 3 respondents with the results of the decision are of the opinion that it is very practical. So it can be concluded that the total average in the media feasibility test has a score of 3.32 with practical criteria.

The fourth stage of effectiveness. Every media that is developed needs effectiveness to support a media in achieving its goals. This is also in line with Riva'i et al. (2020: 109) that effectiveness data refers to the implementation of the desired goals. Thus, learning media is said to be effective if the learning objectives are achieved as seen from student responses and learning results tests. In the media that is being developed, it is necessary to test the validity of the question questionnaire that will be distributed to determine the extent to which learning outcomes have reached the target. According to Zulherman et al. (2021:3) to find out validity data analysis, you can use the validity questionnaire instrument sheet given to material and media experts to carry out validation assessments of learning media. A validation questionnaire instrument was also created for teachers to validate product feasibility tests before testing the product on students. The results of the validity test data shown in the table above are from the entire questionnaire used with a total of 20 question items with a total of 20 respondents, and the R-Table value used is 0.444, the data will be said to be valid if the R- Calculated value is greater than R-Table. Overall the data taken can be concluded that the average result of students' answers with the validity of the questionnaire questions is with an R-value of 0.57554123, the R-Table for 20 people at 5% is 0.444, so the data can be said to be valid. The data from the differentiation test carried out by researchers aims to determine whether or not each question is capable of distinguishing between smart students and ordinary students. So it can be concluded that the question instrument is consistent and can be used to increase the effectiveness of Hots-Based Interactive Learning E-Media to improve the science learning outcomes of Class V Elementary School Students.

The fifth stage is that the data on the analysis of learning results is carried out twice before using the Hots-Based Interactive Learning E-Media media and after using the media. The data above shows that of the 20 students who took the pre-test, only 6 people were in the criteria for learning completeness with average results. -The average class score was 68 and the learning completion percentage reached 30%, while of the total number of 20 students who took the post test there were 17 students who were in the completion criteria with an average score of 86.5 with a completion percentage of 85%. From this data, it can be concluded that after implementing Hots-Based Interactive Learning E-Media, student learning outcomes have increased with moderate criteria in the n-gain calculation of 0.6.

4. Conclusions and Recommendations

HOTS-based learning must be owned by students so that students not only know the material that has been presented but students can also apply their knowledge in life. Learning media is a tool for the learning process that helps educators convey learning material to students in a more effective way. and efficient. In order for this learning objective to be achieved, a tool is needed, called a learning tool, which is used as a guide, basis and reference for educators in carrying out learning activities. By taking advantage of current technological developments, learning media that are usually used and only have a one-way nature are now being innovated so that they can be made two-way or interactive. In the analysis of this research, there is an instrument for student needs with the average results of the diagram being that 50% of students have an interest in learning media, 34% of students understand the material with this media, 34% like the appearance of the media, and 34% of students present the media. appropriately. the total percentage of the completeness of presentation indicator is 47% of teachers, the importance of appropriate completeness of presentation in media development, the presentation indicator is 40% of teachers understand the importance of presenting appropriate media according to students' needs in improving learning, the design indicator is 33% of teachers understand the importance of creativity in creating good and attractive design so that students can be more interested in understanding the material, and indicators of ease of use as much as 38% of teachers need to understand the use and use of each media created so that it is right on target and in accordance with the objectives. The average score in expert validation was 38 answers with a maximum total of 45 with a percentage of 85% in the very good category.

The feasibility of the media was tested, called the media test, with the average number of respondents' answers being 17 with a score of 3.32 in the practical category. Apart from the need and feasibility, if the effectiveness of the media is analyzed, the R-calculated validity value is 0.569, the R-Table for 20 people at 5% is 0.444, so the data can be said to be valid. Calculation of the differentiating power test with a total of 20 question items, 6 questions from the results of the work of respondents who had good criteria, were 13 people, while the results of the answers of students who had excellent decisions were 6 people. As well as reliability testing with a Cronbach's Alpha value of 0.886 which states that this value is greater than 0.6. So it can be concluded that the question instrument is consistent. In the difficulty test, there are 20 item questions, the entire data of which is categorized as easy so that the instrument questions can be done easily by students. Calculation of the normality test for post-test student learning results with a sig value of 0.175 with a decision result greater than 0.05 with a normal decision result. So it can be concluded that the instrument regarding student learning outcomes can be said to be normal. And testing the homogeneity of the Based on Mean sig value of 0.424, which means it is greater than 0.05, it can be concluded that the data is homogeneous. After implementing Hots Based Interactive Learning E-Media, student learning outcomes increased with moderate criteria in the n-gain calculation of 0.6.

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Conflict of Interest

The authors declare there is no conflict of interest.

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