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Feasibility of Physics Teaching Materials With Qur'an Using Generative Learning Model on Sound Waves

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Abstract

Preliminary observations show the limitations of teaching materials that have a relationship with spiritual aspects, especially the Qur'an, which is due to the limitations of teaching materials that contain these aspects. Required learning that stimulates students to generalize religious aspects and learn physics. Therefore, the purpose of this study is to describe the feasibility of physics teaching materials containing the Qur'an by using a generative model on sound wave material. This study aims to describe the validity, practicality, and effectiveness of the teaching materials developed. The research was conducted on 33 students at class XI MIPA 1 MAN 2 Model Banjarmasin using the ADDIE model. Data was taken from the validation results of teaching materials using validation sheet, lesson plan implementation using lesson plan implementation sheet, and students' learning outcomes at the pretest and post-test using learning outcomes tests. The results of this study were 1) the validity of the teaching materials was in the "valid" category with a value of 3.33, 2) the practicality of the teaching materials was in the "very practical" category with a value of 3.63, and 3) the effectiveness of the teaching material was in the "effective/moderate" category with a value of 0,44. This study concluded that physics teaching materials containing Al-Qur'an verses on sound wave materials using generative learning models are declared feasible to be used based on the validity, practicality, and effectiveness of the teaching materials. The implication of this research is the creation of teaching materials containing the Qur'an that are used in schools and creating student habits to link physics and the Qur'an.

Keywords: Generative Learning Model; Qur'anic Verses; Sound Wave; Teaching Materials

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INTRODUCTION

According to UU number 20 of 2003, the definition of education is a means for every student to develop their potential from various aspects, including spiritual aspects. So that students with noble morals and good personalities will be formed. The spiritual aspect is one aspect that indicates that education has been successful and has good quality (Marlina et al., 2021; Mastuang et al., 2019). Learning correlated with the spiritual aspect will bring up moral and religious values in students; as stated by Nurhafizah et al. (2015), students also get additional Islamic religious insight that

contains moral values. Interviews conducted by researchers with one of the physics teachers at Islamic Senior High School 2 Banjarmasin, showed that learning physics is rarely associated with spiritual aspects such as the Qur'an. Due to the limitations of physics teaching materials that correlate physics with the spiritual aspects of religion, especially the verses of the Al-Qur'an. Even though physics learning related to the spiritual aspect is essential, especially in Islamic Senior High School 2 Banjarmasin, considering that Islamic Senior High School 2 Banjarmasin is a school that upholds the values of Islam. It causes students to think that physics as modern science has nothing to do with religious values, especially the verses of the Al-Quran, which are the holy books of Muslims.

The results of the observations showed that most of the students were more enthusiastic about learning related to the Qur'an. Learning physics linked to the Qur'an motivated students to learn more.

Creating a learning resource with a correlation between physics and the verses of the Qur'an as a source of Islamic knowledge can be a solution. The 21st century has a new view of science, integrating religion and science (Purwaningrum, 2015). Thus, it is hoped that students will have quality faith and devotion (IMTAQ/Iman dan Taqwa) and have knowledge and technology insight (IPTEK/Ilmu Pengetahuan dan Teknologi). The Al-Qur'an encourages humans to study all branches of science related to the universe and its aspects (El Fandy, 2013), including physics, a branch of natural science that contains many relationships with the value of life. The development of teaching materials containing the Qur'an is expected to make students able to relate the content in the verses of the Qur'an to physics material, which in this case the material is sound waves.

The sound wave material was chosen because it is more contextual to life (Jannah et al., 2016). The material for sound waves is also easy to find concerning the verses of the Qur'an. So the researchers chose sound wave material as teaching material. The following is one of the verses of the Qur'an related to sound:

وَاَخَذَ الَّذِيْنَ ظَلَمُوا الصَّيْحَةُ فَاَصْبَحُوْا فِيْ دِيَارِهِمْ جٰثِمِيْنَۙ

Terjemah: "Kemudian suara yang mengguntur menimpa orang-orang zhalim itu, sehingga mereka mati bergelimpangan di rumahnya" (QA Hud : 67).

An appropriate model is needed to combine spiritual knowledge with the physical sciences being studied. Most teachers only use conventional learning methods, emphasizing students as objects, not as learning subjects (Shoimin, 2014). This kind of learning causes students only to do what is ordered; the level of students' understanding of the lesson and student activity becomes low. Even though the fact is, students have a wide variety of characteristics, which require teachers to use the proper method so that education can be carried out correctly.

One way to increase the participation of students in the learning process and emphasize students to be more independent and active in seeking knowledge is by using a generative learning model. The generative learning model is a constructivism-based learning model that provides opportunities for students to integrate existing knowledge and new knowledge obtained. Islamic Senior High School 2 Banjarmasin is a religion-based school providing many Islamic religious subjects, especially those discussing Al-Qur'an verses. The generative learning model is a suitable model to use. It is supported by Nurkhayani et al.'s (2013) statement in her research, which states that physics

learning using generative learning gets a good response from students and is proven to improve student learning outcomes. Relevant research results concluded that generative learning models could improve student learning outcomes in physics subjects (Rahmatiya et al., 2018).

Researchers conducted a study entitled "Feasibility Of Physics Teaching Materials With Qur'an Using Generative Learning Model On Sound Waves" based on these facts.

Based on the background above, a problem formula is obtained, "how is the feasibility of physics teaching materials with Qur'an using generative learning model on sound waves?". This study aimed to determine the feasibility of physics teaching materials with Qur'an using a generative learning model on sound waves.

METHOD

The research conducted is a type of *Research and Development* (R&D). The development stages follow the ADDIE research model *(analyze, design, development, implementation, evaluation).* In the first stage, a needs analysis was carried out by taking initial data through teacher interviews and student questionnaires. Furthermore, the product design was carried out as needed. The design that has been made was manifested in a research tool consisting of lesson plans, student worksheets, teaching materials, and learning outcomes tests. The product that has been developed first went through a validation process by three validators, and then the product was implemented on the test subject. This stage produced the practical value of the teaching materials developed based on the assessment results of two observers. A learning outcome test was conducted to evaluate the developed product, which resulted in the effectiveness of the developed teaching materials.

The research object was the feasibility of physics teaching materials with Al-Qur'an on sound wave material using a generative learning model. Meanwhile, the physics teaching materials containing the Qur'an on sound wave material were the research subjects. The trial subjects were 33 students at class XI MIPA 1 of Islamic Senior High School 2 Banjarmasin in the 2020/2021 academic year.

Data collection was carried out using a validation sheet to determine the level of validity of teaching materials, a lesson plan implementation sheet to determine the level of practicality of teaching materials, and a learning outcomes test to determine the effectiveness of teaching materials. Data were analyzed using quantitative data analysis techniques on the value of the validation test results, practicality, and effectiveness of teaching materials.

RESULTS AND DISCUSSION

Analysis Phase

At this stage, the analysis was carried out as preliminary research. Two analyses were carried out, namely an analysis of the students' needs and teaching materials according to the 2013 curriculum. Preliminary data showed that students did not understand the relationship between physics and spiritual aspects in Islam, namely the verses of the Qur'an, even though schools have the vision to integrate education with the spiritual aspects of religion. It is due to the lack of learning media that has Al-Qur'an content. Retrieval of initial data using student questionnaires showed that students were more motivated to learn with a correlation between physics and religion. In the interns' experience at the school, it was known that students were given intense religious knowledge on average. It means that students have sufficient religious knowledge competence.

An analysis of teaching materials was carried out to determine the appropriate material. Sound wave material was chosen because it was considered more authentic with life. It was easier to find verses related to sound wave material, so that students had no difficulty finding related verses. Based on the results of this analysis, it is necessary to develop physics teaching materials containing Al-Qur'an on sound wave material using a generative learning model.

Design Phase

The design of the teaching materials that will be developed consists of a learning implementation plan, student worksheets, teaching materials, and learning outcome tests. The lesson plan is designed to be three meetings with a generative learning model. Al-Qur'an verses are inserted in the remembrance phase, the conceptual framework reorganization phase, and the closing phase. Student worksheets were designed for online learning, namely by presenting experimental results and analysis instructions, so that experiments for data collection do not need to be done. Student worksheets were equipped with stabilization questions that were loaded with the verses of the Al-Qur'an. The learning outcome test was designed to be nine items with different cognitive levels of C2 to C4. Three items contained the verses of the Qur'an. Teaching materials were designed to provide an understanding of physics and its correlation with the Al-Qur'an. The essential parts of the teaching material were "let's think", "let's open the Qur'an", explain the material, the application of technology, sample questions, practice questions, and advice messages. Below is a display of physics teaching materials that have been given the contents of the Al-Qur'an.

Figure 1 Physics Teaching Materials That Are Associated with The Qur'anic Verse

Figure 1 provides an overview of physics teaching materials given the content of the Qur'anic verses. On the three meetings and each meeting, there

are at least three verses of the Qur'an which are raised and inserted in the lesson, namely kalamullah as the opening material, ayo buka Qur'an in the middle of the material, and pesan nasihat at the end of the lesson. Table 1 presents the Qur'an verses used at each meeting in this study.

Table 1 The Verses of The Qur'an Used

Meeting	Title of material	The verses of the Qur'an used
1	Characteristics of sound waves	QS Ali Imran : 191, QS Hud : 67, QS An Nahl :78
2	Sound wave symptoms	QS Ar Ra'd : 13, QS Al Isra : 36, QS Al Baqarah : 6-7
3	Resonance in a sound generator	QS Az Zumar:68, QS Ali Imran: 118, QS Al A'raf: 179

Table 2 Learning Design

Meet	Duration	Media	Subject matter	Approach	Feedback
1	90 minutes	Whatsapp groups, video about the character of sound waves	Sound characteristics	Constructivism	Question and answer
2	90 minutes	Whatsapp groups, sound wave phenomenon video	Symptoms of sound waves	Constructivism	Practice questions
3	90 minutes	Whatsapp groups, photo about resonance illustration	Sound resonance	Constructivism	Submission of discussion results

The approach used was constructivism. Learners were stimulated to build advanced knowledge from some of the knowledge given at the beginning of learning. Because learning was carried out remotely, the initial knowledge given was a video containing physical phenomena. Students were asked to construct knowledge through group discussions. The knowledge related to physics and its correlation with the Qur'an verses needs to be built in learning. In table 2 below, it will be described how the learning design is.

The method used by researchers to stimulate students to do discussion was by taking screenshots of the group chats of each group. It ensured that the discussion results from each group would be published in the group of all students. Students will feel monitored when they see the results of the discussion seen by other students.

Development Phase

Based on the design that has been made, the development of physics teaching materials is carried out with the content of Al-Qur'an verses for sound wave material using a generative learning model. A validation process was carried out to determine whether the teaching materials could be used for their intended purpose. Validation was carried out on teaching materials consisting of lesson plans, student worksheets, teaching materials, and learning outcome tests. Validation was carried out by physics education lecturers of FKIP ULM and physics teachers of Islamic Senior High School 2 Banjarmasin. The validation results of the lesson plan, student

worksheets, teaching materials, and study result test can be seen in table 5, 6, and 7.

Table 3 Results of Lesson Plan Validation

Assessment Aspects	Average	Category
Lesson plan format	3,57	Very Valid
Language	3,25	Valid
Content of Lesson plan	3,25	Valid
Validity	3,34	Valid
Reliability	0,89	Very good

Table 4 Results of Student Worksheets Validation

Assessment Aspects	Average	Category
Student worksheets Format	3,38	Valid
Language	3,25	Valid
Content of Student worksheets	3,23	Valid
Validity	3,29	Valid
Reliability	0,79	Good

Table 5 The Results of The Validation of Teaching Material

Assessment Aspects	Average	Category
Format	3,60	Very Valid
Language	3,21	Valid
Content of teaching material	3,11	Valid
Presentation	3,22	Valid
Benefits	3,00	Valid

Table 6 The Results of The Study Result Test Validation

Assessment Aspects	Average	Category
Construction	3,33	Valid
Language	3,67	Very Valid
Validity	3,43	Very Valid
Reliability	0,98	Very good

Table 7 Average validity of learning devices

Learning Media	Average	Category
Lesson plan	3,34	Valid
Student worksheets	3,29	Valid
Study result test	3,43	Very Valid
Teaching material	3,24	Valid
Average	3,33	Valid

Table 3 shows the results of the lesson plan validation to get the results with the valid category. It shows that the components of the learning implementation plan have been prepared in a relevant and consistent manner, as suggested by Tryanasari et al. (2013). The compilation of the learning implementation plan components follows the aspects of the lesson plan format, language, lesson plan content, and supporting tools. Table 4 shows the results of the student worksheets validation with the valid category. It means that student worksheets can be used according to their function, as Prastowo (2015) described. The function of student worksheets is to relieve educators and more activate students, making it easier for students to understand the questions related to the material taught. Table 5 shows the results of the validation of teaching materials with valid categories. It shows that the teaching material is following the criteria for good teaching material according to the competencies in the 2013 curriculum and is following established standards as described by the Book Center in Tryanasari et al. (2013). It states that books or teaching materials are designed to comply with the standards set according to the needs of students, educators, scientific developments, and the applicable curriculum. The standards

include aspects of the format of teaching materials, language, the content of teaching materials, presentation, benefits, or uses of teaching materials. Table 6 shows the results of the study result test validation with a very valid category. It means that the developed learning outcome test can measure the ability of students, as stated by Mudjijo (Milita, 2018), that the learning outcome test is a type of test to measure the ability of students to answer a problem after being given learning material. Table 7 shows that overall, the teaching materials have a validity average with a valid category. Learning devices are valid if they are included in the good category (Noor et al., 2017).

Implementation Phase

The implementation phase of teaching materials was carried out on test subjects, namely students of class XI MIPA 1 Islamic Senior High School 2 Banjarmasin, in November 2020, with a total of 33 students. Learning is carried out online using the WhatsApp group media. At this stage, the measurement of the practicality of teaching materials is carried out by observing the lesson plan's implementation level. Two observers assessed it, referring to the observation sheet on the implementation of the lesson plan. In table 8, the results of the observations on the implementation of the lesson plan are presented.

Tabel 8 The Practicality of Learning Devices

Meet	Average	Category
1	3,47	Very practical
2	3,72	Very practical
3	3,71	Very practical

Table 8 shows that the three meetings in the implementation stage of teaching materials get very practical categories. It means that the teaching material meets practical aspects and can be carried out well (Nieveen, 2013). Practicality is a measure of the ease and implementation of the developed teaching material. There are two criteria for practical teaching materials: they are declared practical by experts and can be implemented in classroom learning (Mustami, 2017).

Evaluate Phase

The learning outcome test was conducted to determine the level of effectiveness of the developed teaching materials. The learning outcome test was in the form of pretest and post-test questions, which had previously been declared valid. Learning outcome tests are used to assess and measure learning outcomes, especially cognitive assessments relating to mastery of the material being taught (Sudjana, 2010). The results of the pretest and post-test were used to calculate the N-gain value. The N-gain value indicates the level of effectiveness of the learning device. Table 9 shows the results of the N-gain calculation.

Table 9 The Results of The N-Gain Calculation

Average pretest score	Average posttest score	*N-gain*	Category
55,76	75,12	0,44	Moderate

Table 9 shows that the results of the n-gain calculation get moderate category results. It indicates that the teaching materials developed are in the effective category and proven to improve student learning outcomes. The level of effectiveness with the medium category indicates that the teaching materials developed can encourage students to achieve predetermined learning objectives. Suriansyah et al. (2014) stated that effectiveness is an important criterion in every lesson, which indicates that effectiveness is an essential criterion in every that the learning objectives have been achieved. The post-test results above the minimum completeness criteria score are reinforced by the post-test results,

even though the pretest results are below the minimum. The teaching materials are enriched with spiritual insights in the form of Al-Qur'an verses and examples of direct application of physics. It makes it easier for students to understand physics and its correlation with the verses of the Qur'an and motivate students to learn physics. Graph 1 compares the pretest and post-test results for each item on the learning outcome test.

Figure 2 shows that on each item, there is an increase in learning outcomes. It means that every aspect of the material that appears on the questions has been appropriately taught so that there is an increase in students' knowledge. This increase is also because students are accustomed to analyzing by discussing groups according to the phases of generative learning. It indicates that learning with a generative learning model is proven to improve student learning outcomes. In line with Irwandani & Rofiah's (2015) statement, who concluded that the results of his research using a generative learning model gave students a higher level of conceptual understanding than students who were given learning with conventional learning models. As well as Purwo (2016), in his research developing a physics module, said that a physics module based on a generative learning model was feasible to use and received a good response and succeeded in providing an increase in students' critical thinking skills. These results are also in line with the results of relevant research that generative learning effectively improves student learning outcomes (Fitriah, 2013; Hendriansyah et al., 2018; Hidayat et al., 2020; Primayoga et al., 2013). The increase in learning outcomes is also due to the provision of Al-Qur'an verses in each lesson. It is supported by Yulianti & Achyani's (2017) statement that the learning tools integrated with Al-Qur'an verses that they have developed are suitable for use and can improve student learning outcomes.

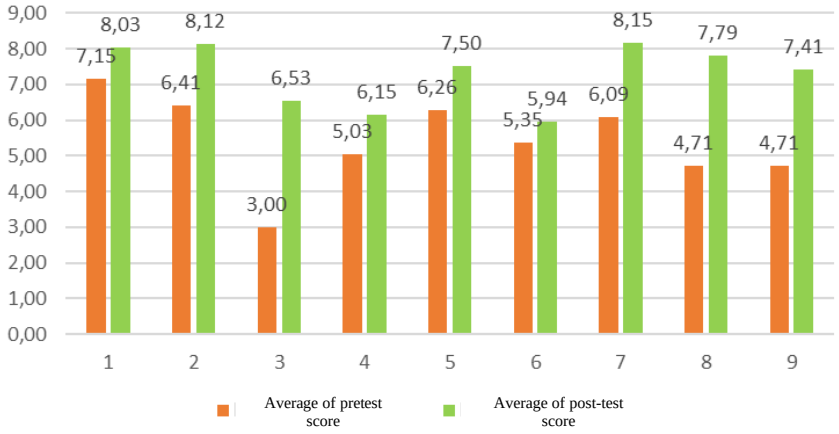

Figure 2 Comparison of pretest and post-test scores per item

From Figure 2, information can be obtained about increasing students' ability to explain the relationship between physics and the verses of the Qur'an. It can be seen in the graphs of questions number 3, 6, and 9. There was a big difference between the pretest and post-test scores. It means that after receiving learning using these developed teaching materials, the ability of students to integrate spiritual and physical aspects has increased.

The weakness of the product is that there are no HOTS-type questions related to the Koran. Problems related to the Qur'an are only limited to explaining. The obstacle in the research is the difficulty of conducting discussions between students. This difficulty is due to learning that is done through online media.

CONCLUSION

Based on the development and test results, it was stated that physics teaching materials containing Al-Qur'an verses on sound wave material using a generative learning model are suitable for classroom learning. It means that teaching materials are suitable to improve students' competence in correlating physics with verses of the Qur'an. Supported by the following data: 1) The results of the validation of physics teaching materials by the three validators get valid results, 2) The practicality of learning devices gets very practical results, dan 3) the results of the calculation of the effectiveness of teaching materials get moderate effective results. The advantage of the developed teaching materials is that students are stimulated to build knowledge of physics from the given Quranic verse. For further researchers, it is expected to use media that allows students to discuss more easily.

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