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DEVELOPING LEARNING MODULE OF SCIENTIFIC-BASED ELEMENTARY LINEAR ALGEBRA SUBJECT WITH ISLAMIC NUANCES

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ABSTRACT

The purpose of this study is to develop a learning module for elementary linear algebra courses based on scientific approach with Islamic nuances that are valid, practical, and effective. This research is a Research & Development using the ADDIE model which consists of five stages, namely Analysis, Design, Development, Implementation, and Evaluation. The test subjects in this study were students of the Department of Mathematics Education, Faculty of Tarbiyah and Teacher Training at UIN Alauddin Makassar, semester 2 (two) class A of 2020. The instruments used were expert validation sheet, module implementation observation sheet, learning management observation sheet, student response questionnaire, student activity observation sheet, and critical thinking test. Based on the results of the study, it was found that (1) the results of module validation and all research instruments were valid; (2) the ability of the lecturer to manage learning is in the very good category, and the implementation of the module is categorized as fully implemented, so that the module developed is categorized as practical; (3) students' critical thinking test showed that of the 35 students, the percentage of students' learning completeness was 85.71%, students' activity in learning was in the very good category, and students gave very positive responses to the use of the module so that the module developed categorized as effective. It can be concluded that the scientific-based elementary linear algebra module with Islamic nuances has met the valid, practical and effective criteria.

Keywords: learning module, elementary linear algebra, scientific, Islamic nuance

1) INTRODUCTION

Education is all activities carried out consciously by individuals or groups through activities in the form of lifelong learning to improve their personality (Nanang, 2014). Education is a potential that humans have from birth and will continue to develop so that they become quality human beings. The purpose of national education, according to UU No. 20 of 2003 concerning the National Education System, is to develop the potential of students to become human beings who believe and fear the Almighty, have noble character, are healthy, knowledgeable, capable, creative, independent, democratic citizens, and responsible (Romi, 2014). So it is inferred that the government, through the law, emphasizes the importance of inculcating Islamic values in

learning. It aims to create people who believe, are pious, and have noble character. Education with Islamic nuances or containing Islamic values in mathematics learning in Islamic madrasas and universities is now starting to be developed. Having an Islamic nuance means that it is related to efforts to integrate mathematics in general with Islamic values by not eliminating the uniqueness of the two sciences (Supriadi, 2015).

The subjects studied, especially in the mathematics education study program, include Elementary Linear Algebra (Siskawati & Chandra, 2018), one of the compulsory subjects that discusses systems of linear equations and matrices, determinants, vectors in 2-dimensional space and 3-dimensional space, euclidan vectors, general vector spaces, inner product spaces, eigenvalues and eigenvectors, and linear transformations. This subject guides students to think carefully and thoroughly (Mufidah, Sulasteri, Majid, & Mattoliang, 2019). The material in the elementary linear algebra subject is so complex that it is important to develop a module as an alternative to independent learning for students. Modules as one of the teaching materials are media or learning facilities that contain materials, methods, limitations of learning materials, instructions for learning activities, exercises, and ways to evaluate which are designed systematically and attractively to achieve the expected competencies and can be used independently (Wibowo & Pratiwi, 2018). The availability of modules as teaching materials is indeed quite easy to obtain, but the availability of modules with Islamic nuances is still rare and even very rarely used in delivering learning materials (Diana, Netriwati, & Suri, 2018).

The limitations of using the Islamic nuanced module in this study are emphasized based on the results of observations obtained from interviews with mathematics education students at UIN Alauddin Makassar batch 2020 who have taken the Elementary Linear Algebra subject in the second semester. The students have a fairly good understanding of Islamic values obtained from several religious subjects such as, the science of the Qur'an, the science of aqidah, the science of hadith, the science of fiqh, and the moral creed. However, these Islamic values have not been obtained in other courses outside of these courses, especially in the Elementary Linear Algebra course. This is because the teaching materials used have not been integrated with Islamic values. In addition, the information obtained shows that the students' thinking skills are still less critical, such as their lack of skill in identifying information, low ability to ask questions, difficulty in expressing ideas or opinions, difficulty in inferring information, and low ability to evaluate information. Other phenomena that arise from students include being unable to dig up information from various sources, and mastering the material only by relying on the material presented by the lecturers.

The phenomena that appear in the elementary linear algebra subject are quite worrying because this course requires students' critical thinking skills. Critical thinking is defined as thinking correctly in obtaining relevant and reliable knowledge, thinking logically, reflecting, being responsible, and thinking proficiently (Kusumah, 2019). Critical thinking is an ability that must be trained in students because this ability is indispensable in life. Lecturers need to help students develop critical thinking skills through strategies and learning methods that support active learning. One of the learning strategies that can be applied to overcome these problems and in accordance with graduate competency standards is to switch to a scientific approach. The scientific approach is a learning approach that uses scientific steps as the main reference for learning. Scientific learning aims to improve intellectual abilities, especially students' critical thinking skills, to shape students' abilities to solve problems systematically, and to develop students' characters (Fitriana, Yusuf, and Susanti, 2016). Based on previous research conducted by Anggoro (2015; Ekawati (2019; Ekawati, Anggoro, & Komarudin (2019), it showed that teaching materials in the form of mathematics learning module on statistical material integrated with Islamic values are feasible and effective for use in mathematics learning activities (Ekawati, 2019). The researchers expect that by developing a module of algebra linear elementary based on

a scientific approach with Islamic nuances, it can improve students' critical thinking skills and understanding of Islamic values.

2) METHODS

The type of research is called "Research and Development" (R&D). Research and development can be interpreted as a scientific way to research, design, produce, and test the validity of products that have been produced (Sugiyono, 2016). The development model used in this research is the Analysis, Design, Development, Implementation, and Evaluation (ADDIE) model developed by Dick and Carry.

Figure 1. ADDIE Development Model

The research on this trying-out product used a one-shot case study design, which is an approach using one-time data collection. The test subjects for this teaching material development product were the second semester students of the Department of Mathematics Education, Faculty of Tarbiyah and Teacher Training at UIN Alauddin Makassar of 2020 class A. The instruments were used as the data collection tools in the form of module validation sheet, observation sheet, and critical thinking test. (1) Validation sheets were used to obtain information about the quality of learning materials based on the assessment of the validators. (2) The learning implementation observation sheet was used to obtain data regarding the implementation of the learning process using the Islamic linear algebra module. (3) Student activity observation sheets were used to obtain data about students' activities during the learning process. (4) The observation sheet for the lecturer's ability to manage learning was also used. To obtain data about the ability of lecturers to manage during the learning process using a linear algebra module with Islamic nuances, (5) Student response questionnaire, and (6) Critical thinking test in the form of an essay. Furthermore, data analysis of the validity, practicality, and effectiveness of the module was carried out based on Arsyad (2016) criteria.

3) RESULTS

The learning module for this scientific-based elementary linear algebra subject with Islamic nuances developed in this study refers to the ADDIE development model, which consists of five stages as follows:

Analysis

First, the analysis carried out was instructional analysis, namely analyzing the material in the elementary linear algebra subject, namely the material for Euclidean vector space and general vector space, determining whether these materials have a relationship with one another, and determining the material to be discussed first. Second, the analysis of students' needs for Mathematics Education Study Program, namely: (1) an approach is needed that is able to reverse

the learning atmosphere from teacher-centered to student-centered. Researchers used a scientific approach here, and (2) teaching materials are integrated with Islamic values. Therefore, in the learning process of elementary linear algebra, it is necessary to support the availability of teaching materials that can improve students' critical thinking skills through scientific-based learning module that is integrated with Islamic values.

Design

Next is the design stage. At the design stage, the researchers began to design teaching materials, lecture teaching unit/lesson plan (SAP), and research instruments in the form of validation sheet, observation sheet, questionnaire, and critical thinking test for elementary linear algebra subject.

Development

The development stage was carried out by making scientific-based teaching materials with Islamic nuances that are in accordance with the structure that has been designed at the design stage. The researchers then met a team of experts to validate the teaching materials and research instruments that have been made.

Implementation

The products that have been developed and declared valid by the validator team are then tested in the learning process in the classroom. At this stage, the researchers applied valid teaching materials and research instruments to the learning process that had been designed in such a way. The revised module is based on input from validators and supervisors who have declared that the module has been valid and then tested on the second semester students of class A 2020, with a total of 35 students. The try-out was conducted to examine the practicality and effectiveness of the developed module. In addition, at this stage, the researchers also observed students' activities in the learning process, the ability of lecturers to manage learning, and the implementation of the module. After all learning activities using teaching materials in the form of scientific-based learning module with Islamic nuances was completed, the students were given a questionnaire to determine the students' responses to the teaching materials that had been implemented and critical thinking test to students.

Evaluation

At this stage, revisions were made based on the input from users of teaching materials as a complement to teaching materials in the form of module that has been developed previously. However, in this study, there were no significant changes in the teaching materials that had been developed previously. There are only a few suggestions from module users, namely in the form of increasing the number of sample questions and adding some pictures that are relevant to the discussion of the material, so that learning elementary linear algebra is not boring and more interesting.

Based on the stage of the development model carried out, the product obtained is a learning module with the results of a product feasibility analysis that includes validity, practicality, and effectiveness.

Validity

At this stage, validation of teaching materials was carried out, where the purpose of this validation was to examine whether the teaching materials, as well as some of the instruments that have been made, are suitable for use when conducting research. The lecturers who validated the teaching materials and instruments were the lecturers from the Department of Islamic Religious Education and the Department of Mathematics Education at UIN Alauddin Makassar. From the results of the expert lecturers' assessment, it can be seen in table 1.

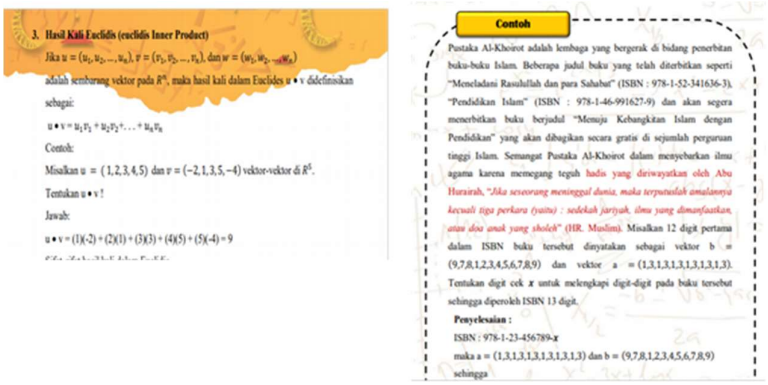
Table 1. Description of Expert Assessment Results on Teaching Materials and Research Instruments

Validation Sheet	Assessment	Description
Module	4.6	Very Valid
Student Response Questionnaire	4.7	Very Valid
Lecturers' ability in managing learning	4.6	Very Valid
SAP (Lecture Teaching Unit)	4.5	Very Valid
Students' Activities	4.6	Very Valid
Implementation of Teaching Materials	4.7	Very Valid
Students' Worksheet (LKM)	4.4	Very Valid
Critical Thinking Test	4.5	Very Valid
Mean Score of Validity	4.6	Very Valid

Table 1 shows that the module and other research instruments fall into the very valid category because every aspect for each device type achieves a $4 \leq M \leq 5$ interval. In addition, the two validators conclude that the teaching materials developed and their assessment instruments are good and can be used with minor revisions. This indicates that the teaching materials, THB, SAP, student response questionnaire, and observation sheets according to the validators are feasible to be tested. Furthermore, the validation process by the validators yielded several suggestions and improvements for the enhancement of the developed product. The results of the revision for each device can be seen in figure 2 below:

(a) Before Revision (b) After Revision

Figure 2. The Module Cover Before and After Revision



(a) Before Revision (b) After Revision

Figure 3. The Test Example Before and After Revision

Practicality

The practicality data of teaching materials in the form of scientific-based learning module with Islamic nuances were obtained from implementation sheets of teaching materials, and observation sheets on the ability of lecturers to manage learning. The results of the observation on the implementation of the syntax component during the try-out stage show that all aspects are in the category of fully implemented $(1.5 \leq \mathrm{M} \leq 2)$.

Furthermore, the ability of the lecturer to manage learning was observed by 1 observer during the learning process, who then filled in the observation sheet or the observation that had been provided. Based on the observation of the ability of lecturers to manage learning, it was found that the average ability of lecturers to manage learning with a score of 3.8 is in the very good category because the score is in the range of $3.5 \leq KG \leq 4$. Thus, it can be concluded that the teaching materials in the form of scientific-based learning module with Islamic nuances that had been tested meet the practical criteria.

Effectiveness

The effectiveness criteria of the module consist of the following: the percentage of students' critical thinking skills is 85.71%, which is in the very good and good categories (getting A and B predicates); students' activities during the learning process; and students' responses. The following data are obtained from the analysis of the critical thinking test, which was taken by 35 students after participating in the learning process using the scientific-based elementary linear algebra learning module with Islamic nuances:

Table 2. Categorization of the Critical Thinking Test

Interval	Convertion Results	Predicate	Category	Frequency	Percentage
91-100	3.52-4.00	A	Very Good	4	11.43
75-90	3.01-3.50	B	Good	26	74.28
60-74	2.76-3.00	C	Fair	4	11.43
0-59	< 2.75	D	Poor	1	2.85
Total				35	100

Based on table 2, it shows that the students get a varied understanding of the material presented by using teaching materials in the form of scientific-based learning module with Islamic nuances. If students' critical thinking tests are analyzed, the percentage of students' learning completeness after implementing the scientific-based elementary linear algebra learning module with Islamic nuances can be seen in table 3.

Table 3. Description of Students' Learning Completeness

Interval	Predicate	Category	Frequency	Percentage (%)
0.00-74.00	C and D	Incomplete	5	14.28%
75.00-100	A and B	Complete	30	85.71%

Table 3 shows that, of 35 students, 5 students were in the incomplete category, with a percentage of 14.28%, and 30 students were in the complete category, with a percentage of 85.71%. Thus, the mastery of student critical thinking test has met the standard of completeness.

Student activities were observed by 2 observers during the learning process. The assessment of students' activities during the learning process consists of seven categories. The observation procedures carried out were that the observers made observation during the learning process and then filled out the observation sheet or observations that had been provided. Based on the observation of students' activities, it was found that the mean score of students' activities is 80.38%, which is in the very good category because the value is in the range of $80 \leq Si \leq 100$. Furthermore, based on the results of the analysis, the average percentage of students' responses to the implementation of learning using scientific-based module with Islamic nuances has a value greater than 80%. Of those aspects stated, the average percentage of students' responses is 94.89%. Thus, the teaching materials developed meet the criteria of effectiveness.

4) DISCUSSION

Research and development of teaching materials were carried out by referring to the ADDIE development model, which consists of five stages, namely: Analysis, Design, Development, Implementation, and Evaluation.

In the analysis stage, it was found that the learning process in higher education is different from the learning process in high school. In any case, students are considered more mature than high school students. The analysis of students' needs shows that the atmosphere of learning is still teacher-centered, which results in a lack of students' critical thinking skills. Putri and Wahyudi (2020) suggested that the learning process that is still teacher-centered can result in students being passive and not understanding the learning materials. Therefore, the researchers used a scientific approach. Furthermore, to support learning, teaching materials in the form of module have been developed. This is in line with the theory asserted by Trianto (2014) that one of the ways to realize optimal learning needs is by supporting the use of teaching materials.

In the design stage, the researchers began to design a scientific-based Elementary Linear Algebra module, while in terms of Islamic values, the module was developed by integrating Islamic values. The module was arranged according to the module structure proposed by Ratnasari (2018), that a module consists of several components, namely titles, instructions for use, competencies to be achieved, supporting information, sample questions, practice questions and assignments, and assessments.

At the development stage, the module developed is a module in the form of printed media, presented with a display that matches the module display design that has been determined at the design stage and compiled by applying Islamic values and scientific-based. The results of the module validation and research instruments are in the very valid category with a mean score of

4.6. This is in line with the validity theory proposed by Arsyad (2016) that teaching materials have an adequate degree of validity if the average validity value for all aspects is at least in the valid category and the validity value for each aspect is at least in the valid category.

The implementation stage shows that the elementary linear algebra module based on a scientific approach with Islamic nuances has met the practicality criteria. The implementation sheet of the module is one of the supports for the practicality of teaching materials, which includes components of syntax, social interaction, reaction principles, and support systems, all four of which are fully implemented. The ability of lecturers to manage learning is in the very good category so that the scientific-based and Islamic-nuanced elementary linear algebra learning module that has been developed met the practical criteria. In addition, this learning module is also categorized as effective based on the critical thinking test, students' activities in learning, and students' responses to the use of the module. Therefore, the use of elementary linear algebra learning module based on a scientific approach with Islamic nuances can help improve students' critical thinking. This is in line with the theory asserted by Trianto (2014) that learning is said to be classically complete if at least 85% of students achieve a minimum score of 75. Likewise, it is supported by the theory of Arsyad (2016) that a teaching material is said to be effective if it meets the criteria of effectiveness, that is the average percentage of mastery learning is in the fair, good, or even very good category, as well as a positive student response to the module if at least 50% of students give a positive response to a minimum of 70% of the number of question items or statements in each aspect. In the research of Ikbal and Khuzaimah (2020),) it was also explained that students gave a positive response to the use of module in learning which had a positive impact on their learning outcomes.

The last stage is evaluation. Some suggestions from module users are in the form of increasing the number of sample questions and adding images that are relevant to the discussion of the materials, so that learning elementary linear algebra subject is not boring and more interesting.

The results of this study support previous research, namely the research conducted by Ekawati (2019); Supriadi (2015); Mawardi, Dewi, Asmah, & Pratiwi (2019); Salasiyah (2017). However, in this study, the linear algebra module developed was integrated with Islamic values (Islamic nuances) and based on a scientific approach. The limitations of this module are that the materials presented are limited to Euclidean vector space, and general vector space, as well as the verses or hadiths related to the sample questions and questions are still minimal. In other words, further research is needed to fully develop modules that are integrated with verses or hadiths. The implication of this research is that the Elementary Linear Algebra module based on a scientific approach with Islamic nuances can make the learning process more active. The stages of the scientific approach, which consist of observing, asking questions, gathering information, associating, and communicating are able to make learning activities more student-centered. In addition, the module equipped with Islamic nuances makes students' understanding of Islamic values better.

5) CONCLUSION

The learning module for basic linear algebra subject based-scientific with Islamic nuances was developed using the ADDIE development model with 5 stages, namely analysis, design, development, implementation, and evaluation, and has met the valid, practical, and effective criteria.

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