Islamic-Nuanced Linear Algebra Module with Problem-Based Learning Approach for Linear Equation System Material

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Abstract. This research and development aim to determine the feasibility and attractiveness based on the student's responses toward the development of Islamic-Nuanced Linear Algebra Module with Problem-Based Learning Approach for Linear Equation System Material. This research is Research & Development model proposed by Borg & Gall that has been modified so that it only reached the 7th stage. Data collecting techniques used was a validation questionnaire sheet. The instrument used was in the form of a validation questionnaire to determine the feasibility of the product and questionnaire of students’ responses to find out the attractiveness. Data analysis techniques used were quantitative descriptive and qualitative descriptive. The results of the validation obtained an average percentage score of 80.00%; 86.15%; 87.62%; 79.23%; 92.50% from the syllabus and material experts, language experts, media experts, and religious experts with the feasible and highly feasible criteria respectively. The results of the assessment on the attractiveness through the small-group trial and large-group trial were 77.50% and 79.06% with the attractive criteria. It can be concluded that the developed product is feasible and attractive.

1. Introduction

Improving the quality of education in the learning process in higher education can be done through various strategies; one of the alternatives that can be taken is by developing a teaching material [1]. The development of teaching materials is carried out in order to facilitate educators (lecturers) and students in the learning process to demand the participation in developing the students’ potential [2] especially in learning linear algebra. In addition, the selection of the right learning model and method is one of the most effective factors in determining the quality of learning in the field of education[3]. The teaching materials prepared must be based on the characteristics of students’ needs that are easy to understand and interesting. Therefore, it is necessary to develop teaching materials that are in accordance with the characteristics of the student's needs.

The module to be developed is a linear algebra course module. The main topic in linear algebra is a system of linear equations and their solution as a part of mathematics that studies the relationships and properties of numbers using common symbols [7]. The development module uses a problem-based learning (PBL) model that presents the nuances of Islamic values. PBL is effectively applied to the college level [8]. PBL learning strategy is a student-centered learning model as a technique to improve student learning [9]. PBL is a learning model that at the beginning presents well-structured problems that must be solved at the end of learning so that it can conduct investigations to gain knowledge during learning [5], [10]–[12]. With regard to the nuances of Islamic values presented in the module, it is an added value to obtain Islamic religious values during the learning process [10]. The development of the course module in question is to produce a new product which is then developed into a specific product
and tested for effectiveness [13]. There are previous studies that develop modules by producing a product that is feasible and effective to be used as teaching material by applying the PBL model, including research and development; development of integrated character-education science modules, development of physics modules, development of PBL-based physics modules, development of biological modules to improve cognitive learning outcomes, development of modules in accounting system courses [2], [14]–[17]. The previous research also explained that the PBL model was effective to be used in learning [18]–[24].

Based on the existing research and development, this study aims to develop an up-to-date teaching material in the form of linear algebra course module with Islamic religious values through PBL approach in the linear algebra equation material at the university level. Research and development were carried out to determine the feasibility and attractiveness toward the developed product so that it is appropriate and attractive and can be used in learning.

2. Research Methodology

The type of research used was Research and Development [13]. This research is Research & Development with the modified model of Borg & Gall that only reached the 7th stage. Based on the intended development model flow, simplification and limitation of ten steps were made into seven steps due to factors of limited energy, funds, and time [25]. There were two types of data used, namely, qualitative data and quantitative data. Data collection technique used was a validation questionnaire sheet. The instruments used were in the form of a validation questionnaire to determine the feasibility of the module and questionnaire for the responses of students to find out the attractiveness. Data analysis techniques used in research and development were quantitative descriptive to process data in the form of scores from the assessment of syllabus and material experts, language experts, media experts, religious experts, and student responses. The qualitative descriptive was used to describe the data in the form of comments suggesting improvements from validators. The steps of research and development can be seen in Figure 1.

![Figure 1. Research Steps with Research and Development (R & D) Method](image)

3. Results and Discussion

The product of the development is a linear algebra course module with Islamic values through the Problem Based Learning (PBL) approach in the linear equations systems material. The initial information was used as a guideline in designing the initial product development module, which was
tailored to the characteristics of student needs and content standards. The linear algebra course module with Islamic religious values through the PBL approach is supplemented with activities based on PBL steps on the linear equation system. The stages used in this research and development only used seven out of ten based on the procedure proposed by Borg and Gall.

The results of research and development in this study are based on 7 stages:

1. Potential and Problems
   Research can be started based on the existence of potential or problems. The potential and problems in the field can be used as a reference for developing research products. The researchers of this study determined the potential and problems that occur in the field, namely on several campuses related to learning resources used in understanding linear algebra courses during the learning process. To obtain the potential data and problems, the researcher made observations by distributing questionnaires. The questionnaire was in the form of a series of six questions accompanied by reasons. The questionnaire was validated before it was distributed.

2. Data Collection
   After determining the potential and problems that exist in the field, further information needs to be collected that can be used as the material for product planning. The problems became the background for conducting a preliminary study of needs analysis. The need analysis was conducted to obtain information data as initial data collection. Data collected from the results of the analysis in the form of field studies on the campuses as the location of the research and analysis of the literature regarding the appropriate research. The data of need analysis was obtained from the results of distributing questionnaires. The researchers collected various information that supports the products, among others:
   a. Field studies conducted at Raden Intan State Islamic University Lampung, Lampung University, and the Indonesian Teknokrat University. Field studies were conducted to analyze learning resources and learning methods used on the sites and then analyzed the characteristics of new learning resources needed.
   b. Literature study on research themes in line with product development modules, syllabus analysis of linear algebra courses, analysis of the literature on the Islamic values in Linear Equation System material, literature analysis of PBL approach steps applied in the module.

3. Product Design
   Information and data from field studies and literature studies can be used as a reference material for product development planning. Data and information collected were used as a material for consideration for analyzing the needs of new learning resources in the form of modules to be developed:
   a. Learning resources in the form of Islamic-Nuanced Linear Algebra Module with Problem-Based Learning Approach for Linear Equation System Material.
   b. The steps of learning activities applied in the module through the PBL approach.
   After doing product planning, Islamic-Nuanced Linear Algebra Module with Problem-Based Learning Approach for Linear Equation System Material was designed. In order to facilitate the design of the module, the researchers must determine the important characteristics that will be presented in the module. The development steps at this stage included the preparation of a syllabus for linear algebra courses, the preparation of modules with Islamic values and PBL approach steps applied in the module on SPL material. Preparation of product assessment instruments in the form of questionnaire instruments in the form of scores, namely, validation questionnaire sheets to determine the feasibility of the syllabus and module by the validators (material experts, language experts, media experts, as well as religious experts) and students’ responses questionnaires to determine the attractiveness of the developed product.

4. Design Validation
   Design validation is a step to assess whether the product development plan is sufficiently feasible before testing the product. The validation consisted of syllabus validators and material experts,
language experts, media experts, and religious experts. Validation of the syllabus by the validator was only done once, while the validation by the validator team (material experts, language experts, media experts, and religious experts) was done twice. The validation stages for the product were carried out, namely initial product validation and product validation after revision to revised the product’s improvements.

a. Syllabus and Material Expert

The validation by syllabus expert was an assessment of the contents’ presentation of the linear algebra courses syllabus. The material expert validation aimed to test the feasibility of the product and the module’s conformity from seven aspects of the assessment indicators based on the validation sheet. The material expert validation consisted of three competent validators in the field of mathematical science. Before developing the product, the syllabus of linear algebra courses was first developed. The development of the materials of the product was adjusted to the contents of the syllabus. After the development of the syllabus has been completed, which was accompanied by the creation and development of product modules in linear algebra courses, then the syllabus and the module were validated by the validator team.

b. Language experts

The validation by the language experts was an assessment on the suitability of the three aspects of the assessment indicators based on the validation sheet. Language experts selected by the validator who is an expert in the field. With regard to syllabus validation and material validation, language validation was also carried out simultaneously.

c. Media Experts

Test media experts is a validator’s assessment by media experts on module presentation and graphics. One media experts were selected who is an expert in his field. Regarding the validation of the syllabus, material validation, language validation, media validation is also carried out. Media validation is done by one validator.

d. Religion Expert

Validation by religious experts was an assessment on the suitability of material presented with nuances of Islamic religious values that relate to the verses of the Quran. A religious expert was chosen who is an expert in the field of religion. Religious validation was carried out by one validator.

The results of the validation by the validator team which includes the syllabus and material experts, language experts, media experts, as well as religious experts on the initial product can be seen in Table 1.

| No | Validator Results | Total Score | Maximum Scores | Percentage | Criteria |
|----|-------------------|-------------|----------------|------------|----------|
| 1  | Syllabus Expert   | 72          | 90             | 80.00%     | Feasible |
| 2  | Material Experts  | 139         | 195            | 71.28%     |          |
| 3  | Language experts  | 75          | 105            | 71.43%     |          |
| 4  | Media Experts     | 82          | 130            | 63.08%     |          |
| 5  | Religion expert   | 29          | 40             | 72.50%     |          |

Table 1 contains the results of the validation at the initial production stage. The result of validation from the syllabus expert obtained an average percentage of 80.00% which is in the feasible criteria, the material expert with an average percentage of 71.28% in the feasible criteria, language expert with an average percentage of 71.43% in the feasible criteria, media expert with an average percentage of 63.08% in the feasible criteria, and lastly from the religious experts with an average percentage of 72.50% in the feasible criteria. The initial product still needed improvement in the design revision stage.
5. Design Revision
Revisions were based on comments and suggestions from expert validators after the syllabus and module were validated by the experts. The suggestions for improvement were then used as a reference for the researchers to revise the syllabus and module to produce products.

   a. Material Expert
The validation on the initial product from three material experts obtained comments and suggestions for improvement. The material experts stated that the product still needs some improvement, some of which need to be added the proof of the theorem which is still considered as a frame of thinking and not yet reached the proven proof stage. Additions to the relationship of what is obtained from a material to Islamic values. Presentation of graphics and drawings needs to be given a clear name. The revision was carried out in accordance with the comments and suggestion from the three material experts.

   b. Language experts
The validation on the initial product from the language expert obtained comments and suggestions for improvement. The language expert stated that the product still needs some improvement, some of which were a little error in writing and grammar. The revision was carried out in accordance with comments and suggestion from the language expert.

   c. Media Experts
The validation on the initial product from the media expert obtained comments and suggestions for improvement. Many improvements need to be made: too many contents on the design of the module display that made it less interesting, sentence errors and ineffective use of language, errors in writing words and sentences, margin limits and display sizes needed to be considered to be consistent and to be adjusted, the abbreviations should be written in general style and must be consistent. The revision was carried out in accordance with comments and suggestion from the media experts.

   d. Religion Experts
The validation on the initial product from the Religion expert obtained comments and suggestions for improvement. The religion expert stated that the product still needs some improvement based on the 5 indicators of assessment aspects, the module was actually good but it needed a few improvements including: there are several verses that need to be changed in relation to the context of information presented, improvement in the suitability and accuracy of the verses used, improvements in terms of interpreting and assuming the verses of the Qur'an, the presentation of verses by linking the need for improvement with the use of appropriate words and sentences, and the need to link Islamic religious values from the explanation of material (wisdom). The revision was carried out in accordance with comments and suggestion from the religion experts.

   The results of the validation by the validator team which included the syllabus, material, language experts, media, and religious experts on the product after the improvement can be seen in Table 2.

### Table 2. Results of Product Validation After Revision

| No | Validator Results | Total Score | Score | Percentage | Criteria       |
|----|-------------------|-------------|-------|------------|----------------|
| 1  | Material Expert   | 168         | 195   | 86.15%     | Highly Feasible|
| 2  | Language experts  | 92          | 105   | 87.62%     | Highly Feasible|
| 3  | Media Experts     | 103         | 130   | 79.23%     | Feasible       |
| 4  | Religion Experts  | 37          | 40    | 92.50%     | Highly Feasible|

   Based on Table 2, the results of validation after revision obtained the following results: the material expert with an average percentage of 86.15% in highly feasible the criteria, language experts with an
average percentage of 87.62% in the highly feasible criteria, experts media with an average percentage of 79.23% in the feasible criteria, as well as religious experts with an average percentage of 92.50% in the highly feasible criteria.

6. Product Trials

The product that had been improved so that it became a design Islamic-nuanced linear algebra module with a problem-based learning approach for linear equation system material. Then the product trials were carried out to determine the students' responses toward the attractiveness of the development module. The product trials were conducted in 2 ways, namely, small-group trials and field trials.

a. Small-Group Trial

At this stage, the trial was conducted to determine student responses and to provide an assessment of the quality of the product. The initial step carried out by the researcher in conducting the trial was to distribute the module of linear algebra courses to students, and then the researcher explained the general description of each learning activity for each sub-material as presented in the module. The next step was to provide a questionnaire for assessing students' responses toward the developed module.

b. Field Trial

The field trial was the last stage of formative trials that need to be carried out. At this stage, the developed product must near perfection after going through the first stage. The field trial was conducted on 50 heterogeneous students, according to the characteristics of the target population.

The results of product trials which consisted of small-group trial and field trial can be seen in Table 3.

| No | Jenis Uji Coba Produk | Jumlah Skor | Skor Maksimal | Presentase | Kriteria |
|----|-----------------------|-------------|---------------|------------|----------|
| 1  | Uji Coba Kelompok Kecil | 930         | 1200          | 77.50 %    | Menarik  |
| 2  | Uji Coba Lapangan     | 2.372       | 3.000         | 79.06 %    |          |

Based on Table 3, the small-group trial obtained an average percentage of 77.50% in the attractive criteria. The field trial obtained an average percentage of 79.06% in the attractive criteria. Based on the percentage, it can be concluded that the Islamic-nuanced linear algebra module with a problem-based learning approach for linear equation system material is in attractive criteria to be used in the learning process. This means that the development of the product meets the attractiveness criteria to be used as teaching materials for linear algebra courses at the college level. The results of the overall students’ responses toward the Islamic-nuanced linear algebra module with a problem-based learning approach for linear equation system material can be seen in Figure 2.

Figure 2 illustrates the tabulation of the results of students’ responses in the small-group trial and field trial. In the small-group trial, the percentage was 77.50% with the attractive criteria while the field
trial was 79.06% with the attractive criteria. This means that there was no difference in the small-group trial and in the field trials the results of students’ responses toward the Islamic-nuanced linear algebra module with problem-based learning approach for linear equation system material is in the interesting criteria to be used in the learning process. Based on the results of the validation and product trials that have been carried out by the team of validators and students toward the developed module stated that this module is feasible and interesting. Then it can be said that this module has been developed to produce a final product that is feasible and interesting to use.

7. Product Revision

Based on the results of product trials, if the students’ response says that this product is interesting, it can be said that the module product has been developed to produce the final product as hoped. If the product is not perfect, the results of the trials will be used as a material to improve the product, so that it can produce the final product in the form of an Islamic-nuanced linear algebra module with problem-based learning approach for linear equation system material that is appropriate to be used.

The product is an Islamic-nuanced linear algebra module with a problem-based learning approach for linear equation system material as lecture teaching materials for the college level. The process of constructing the teaching materials for this module uses the Windows Office: Microsoft Word to create content or material from modules and several other applications such as Corel Draw X4 to design the covers.

a. Validation by Syllabus and Expert Material

Validation of syllabus by validator was only done once; syllabus which has been validated by validator can be seen in Figure 3.

![Figure 3. Syllabus Validated by Validator](image_url)

Figure 3 illustrates the syllabus which was validated by the validators. According to the experts, the syllabus related to the contents of the discussion is appropriate. In conclusion, the assessment of the syllabus was considered good so that it can be used without revision. This means that the syllabus can be used as a guideline in the development of learning and assessment systems without the need for revision in the second revision stage.

Validation by material experts on the initial product (before revision) and product after improvement (after revision) can be seen in the following figure:
Figure 4a illustrates the initial product before revision. According to comments on suggestions for improvement from material experts on page 26, it is still necessary to add the proof of the theorem which was still considered as a frame of thinking and not yet reached the proven proof stage. Then the revision was done based on the comments and suggestions from the material experts. Figure 4b illustrates the product after the revision. The proof has been added by applying the syllogism rule hypothesis and conjunction in logic.

b. Validation by Language Experts

Validation by language experts on the initial product (before revision) and product after improvement (after revision) can be seen in the following figure:
Figure 5a illustrates the initial product before revision. According to the comments and suggestions from the material and language experts, page 14 still needed some minor improvement in writing and grammar. The revision was done based on the comments and suggestions from the material and language experts. Figure 5b illustrates the product after revision which had been replaced by good and appropriate writing and grammar.

c. Media Expert

Validation by media expert on the initial product (before revision) and product after improvement (after revision) can be seen in the following figure:

Figure 6a. Before Revision

Figure 6b. After Revision

Figure 6a illustrates the initial product before revision. According to comments and suggestions for improvement from media expert, on page 8, the module’s design display contained too much content and less attractive. The revision was done based on the comments and suggestions from the media experts. Figure 6b illustrates the product after the revision to reduce the content in the design of the module’s contents and the addition of images to give an interesting impression on the module’s display.

d. Religious Expert

Validation by religion on the initial product (before revision) and product after improvement (after revision) can be seen in the following figure:

Figure 7a. Before Revision

Figure 7b. After Revision

Figure 7a illustrates the initial product before revision. According to comments and suggestions from the religious and language experts, the module’s content was rewritten to make it more religiously acceptable. The revision was done based on the comments and suggestions from the religious experts. Figure 7b illustrates the product after the revision to align the content with religious principles.
Figure 7a illustrates the initial product before revision. According to comments and suggestions for improvement from the religious expert on page 6, there are several verses that need to be replaced to improve the suitability and accuracy of the verses of the Quran used. The revision was done based on the comments and suggestions from the religious expert. Figure 7b illustrates the product after the revision where the Al-Baqarah verse 164 was replaced with the Ar-Ra‘id verse 11 to be more suitable with the information presented.

e. Students’ Responses

The results of students’ responses in the small-group trial and field trial on the developed product obtained the attractive criteria with an average percentage of 77.50% and 79.06%, thus it can be concluded that the developed product is attractive and appropriate to be used as teaching material in learning. The development of the Islamic-nuanced linear algebra module with a problem-based learning approach for linear equation system material obtained good results. According to experts’ assessment, the module is in accordance with the predetermined assessment indicators.

In previous research and development, a proper and effective module was produced using the PBL model approach. Likewise, the results of this research and development of the module in linear algebra also obtained a feasible and interesting product. The difference of this product with the previous ones is that this module presents the nuances of Islamic religious values that have not been found in previous studies in linear algebra courses at the college level.

4. Conclusion and Suggestions

Based on the results of validation and trials, the development of Islamic-nuanced linear algebra module with a problem-based learning approach for linear equation system material produced a feasible and attractive product. This research and development are still requires to arrive at the stage of dissemination and implementation of the final product to test the effectiveness of the module and to know its effect on improving the quality of learning in linear algebra courses especially in linear equation system so that the module that could be more qualified and can be used in learning. Hopefully, this research can be useful and become a reference source for further research.

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