The Validity of Algebraic Module with Living Values Education for Junior High School

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Abstract. The importance of algebra teaching materials that can make students learn independently and can build students’ character is the main reason to develop algebraic module with living values education. This study aims to produce a valid algebraic module with living values education. This type of research is a development research. Module development used the ADDIE (Analyze, Design, Development, Implement, and Evaluation) model. Data collecting technique to know validity is the questionnaire. The module was validated by three experts. Aspects assessed are content eligibility, linguistic, presentation, and graphical. The average validation value assessed by the validators belongs to a very valid category.

1. Introduction
Algebra is identified as a gatekeeper for higher mathematics [1]. In the 2013 curriculum, the algebraic material became the beginning of the introduction of algebra to seventh-grade students of the junior high school. Then, algebraic thinking is founded on conceptual understanding, smooth computing, geometrical reasoning, and processes related to measurement [2]. However, many difficulties are experienced by students in learning algebra. For instance, students do not understand the use of letters as a variable [3], have difficulty in performing operations on the unknown, and do not recognize commutative and distributive properties [4]. The most common difficulty is that students do not understand mathematical equivalence that is the values from the right and left sides of the equal sign are equivalent [4] [5].

Various difficulties of students in learning algebra can occur due to the limitations of student learning resources, although it is essential to make algebra accessible to all students [6]. Based on observations conducted by researchers, it was shown that students’ learning accesses only depend on learning by teachers and mathematics textbooks used in the school. The results of interviews with students indicate that the language of textbooks is difficult to understand. Whereas, the character, needs, and abilities of students vary in learning. Therefore, learning resources or learning materials are needed to accommodate students' needs independently.

From various difficulties encountered by students, it is necessary to develop systematic learning materials or sources, according to the needs of students, and can help students learn independently in understanding algebraic forms and their operations. The expected material or learning resource is a module because the module can help students learn independently [7] [8] [9]. A module is one of the teaching materials which is designed to help students master specific learning goals [10].
Module development must be adapted to the relevant curriculum. Indonesia applies the 2013 curriculum which emphasizes strengthening students’ characters to prepare their life skills [11] [12]. Character strengthening is needed because education is a process towards intellectual, social, and moral maturity [13]. According to the statement, the values that can strengthen the character of students should be included in teaching materials because teaching materials play important roles in the overall curriculum. Strengthening character in schools can be done through living values education [14]. Strengthening character must be developed based on character education of life values, which means that it is based on the basic values of life so that it will be easier to be internalized and implemented [15]. Education that teaches values to strengthen character can be a tool that is able to provide positive outcomes not only on student attitudes but also on academic achievement [16]. Hence, students’ cognitive and affective aspects will be balanced. Character strengthening can be done in regular lessons at school [17] including in mathematics lessons, specifically in algebraic form material.

Based on this background, it is necessary to develop modules on the topic of algebraic forms that contain living values education for junior high schools. Living values education contains twelve values, namely peace, respect, love, tolerance, honesty, humility, cooperation, happiness, responsibility, simplicity, freedom, and unity [14]. But, the value that will be developed into the module is only love, peace, tolerance, cooperation, and responsibility. Then, the validity of the module is tested because validity is one of the criteria for the quality of a module.

2. Method
This study used the Research and Development (R&D) method. Development research in the field of education is a study that produces educational products and tests the efficacy of these products on pre-existing products [18]. The developed product in this study is an algebraic form module with living values education for junior high schools. The development model used ADDIE. The ADDIE model is a dynamic and flexible guideline for developing effective teaching and learning products [19]. The ADDIE model consists of five stages consisting of analyzing, designing, developing, implementing, and evaluating [20] [21].

In the analyzing stage, the researcher conducted an initial analysis, analysis of the literature or related teaching material and needs analysis. In the designing phase, the researcher drew out a framework and draft modules, as well as research instruments. In the developing stage, the researcher changed the design specifications to the physical form that produces the prototype, and what is essential at this stage is expert validation. In the stage of implementing, the products that had been validated were tested through small groups, then evaluated and revised. Trials can end in the large groups. The evaluation phase can occur in the previous four stages that are in the form of formative evaluation because the purpose is for revision. Meanwhile, the evaluation to assess the overall effectiveness of the module is called summative evaluation [21]. The produced module would be assessed for its quality from validity, practicality, and effectiveness. However, in this article, researchers will only discuss module validity.

Data collection to determine module validity is through expert validation. The instrument used in this study was a questionnaire. Questionnaires are useful for assessing the initial design of modules based on aspects of content eligibility, linguistic, presentation, and graphical. The questionnaire was addressed to two mathematics lecturers from Sarjanawiyata Tamansiswa University and one mathematics lecturer from Sebelas Maret University. The results of the validator assessment were analyzed using a Likert scale which was converted into percentages based on the formula (1) [22].

\[ p = \frac{f}{N} \times 100\% \]  

information:
- \( p \) : percentage of validity value
- \( f \) : score obtained
- \( N \) : maximum score
The categories of module validity based on the results of percentages are categorized as:

| Interval $p$ (%) | Category     |
|------------------|--------------|
| 0 – 20           | Not valid    |
| 21 – 40          | Less valid   |
| 41 – 60          | Quite valid  |
| 61 – 80          | Valid        |
| 81 – 100         | Very valid   |

Adapted from reference [22]

Module assessment indicators based on aspects of eligibility content, linguistic, presentation, and graphical can be seen in Table 2.

| Aspects          | Indicators                                                                 |
|------------------|-----------------------------------------------------------------------------|
| content eligibility | conformity of material with core competencies and basic competencies          |
|                  | material accuracy                                                            |
|                  | material update                                                              |
|                  | conformity with the values of living values education                         |
| linguistic       | straightforward                                                               |
|                  | communicative                                                               |
|                  | according to the development of students                                     |
|                  | conformity with Indonesian language rules                                    |
|                  | use of terms, symbols or icons                                               |
| presentation     | presentation technique                                                       |
|                  | supporting presentation                                                      |
|                  | the coherence of thought flow                                                |
| graphical        | module size                                                                  |
|                  | module cover design                                                          |
|                  | contents design                                                              |

3. Results and Discussion

3.1 Validity of module

Module validation is conducted to determine whether the module is valid to be tested or not. The validator provides an assessment by filling out a questionnaire and providing suggestions for improving the module. Suggestions from the validator are used as a reference to revising the modules to produce more sound modules. Validation data for algebraic forms with living values education can be seen in Table 3.

| Aspects of assessment | Validator 1 (%) | Validator 2 (%) | Validator 3 (%) | Average (%) | Category         |
|-----------------------|-----------------|-----------------|-----------------|--------------|------------------|
| Content eligibility   | 83.33           | 80.00           | 80.00           | 81.11        | Very valid       |
| Linguistic            | 88.33           | 86.67           | 80.00           | 85.00        | Very valid       |
| Presentation          | 87.50           | 80.00           | 80.00           | 82.50        | Very valid       |
| Graphical             | 92.17           | 82.61           | 84.35           | 86.37        | Very valid       |
| Average (%)           | 87.83           | 82.32           | 81.08           | 83.74        | Very valid       |
Based on Table 3, it can be seen that the evaluation of each validator is 87.83%, 82.32%, and 81.08% with an average value of 83.74% including in a very valid category. The average value for each module assessment component can be seen in Figure 1.

This module has a very valid category in the aspect of content eligibility with an average value of 81.11%. It means that the material in the module is in accordance with the core competencies and basic competencies of the algebraic form material based on the 2013 curriculum. The material has been fully assessed for the core competencies and selected basic competencies. The material in the module has been assessed accurately regarding concepts, definitions, examples/cases, terms, notations/symbols, and the accuracy of references. Modules have been assessed as up-to-date that is the compatibility of the material with the development of science, actual, and updated literature. The contents of the module are compatible with the living values developed. The living values which are developed in this module are love, peace, tolerance, cooperation, and responsibility.

This module has a very valid category on linguistic aspects with an average value of 85%. This means that the sentence used in the module is straightforward, communicative, following student development, and following the rules of the Indonesian language. This means that the structure of the sentence used in the module is appropriate, effective, standard, and following Indonesian grammar. The sentence used is easy to understand, can stimulate students to think critically, according to the level of emotional and intellectual development of students.

This module has a very valid category in the presentation aspect with an average value of 82.5%. It means that the module has fulfilled an excellent presentation technique that is the systematic presentation of the material is consistent, and the concept is presented in stages. The modules are also considered to have support for presentation, and it means that the module has examples of questions in each material, practice questions, key answers for practicing questions, and summaries. The modules are also considered to have a flow of thought and coherence which means that the material is related.

This module has a very valid category in the graphical aspect with an average value of 86.37%. It means that the module meets the standards according to the ISO (International Organization for Standardization) standard. The module cover design displays a good center of the view, describes the contents of the material, comparable font size, the color of the module title contrasts with the background color and looks harmonious. The design of the module content fulfills good typing such as non-excessive font variations, proportional letter sizes, proportional margins, corresponding illustration and description, common space between lines, the spacing between usual texts, and creative and dynamic.

The validity in developing a product must be based on scientific knowledge, and all components must be consistently related to each other [23]. This module is by core competencies and basic competencies and the principles of scientific learning based on the 2013 curriculum that meets the

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure1.png}
\caption{The average of module assessment component}
\end{figure}
standards of content eligibility, linguistic, presentation, and graphical [24]. Content must be comprehensive which includes facts, concepts, principles, procedures, and values of life [25].

Module developed combine living values into algebraic form material in the form of illustrations that can stimulate their algebraic knowledge while teaching value. As shown in Figure 2.

![Figure 2. Example of living values in the form of illustration](image)

In Figure 2 the value contained in the illustration is love because Mila shared milk cakes with her friends at school and tutoring. Through that illustration also students are trained to determine the algebraic form of the problem given. This module also contains quotes about living values, namely love, peace, tolerance, cooperation, and responsibility. Modules of algebraic with living values education provide an algebraic learning experience and indirectly provide experiences about the value of life that is meaningful to their social life.

3.2 Revision

The revision phase aims to correct the deficiencies in the module to produce a perfect module. The module is revised based on suggestions from the validators. The revised module was given back to the validators for further discussion. The revision is complete if the validators have stated that the developed module is valid and ready for trial. Some revised aspects based on suggestions from the validators are: (1) the writing of the title of the image that is not appropriate; (2) the use of bold letters on the characteristics of operations is considered too excessive; (3) the place for filling students' answers is less wide; (4) does not include the terms of the order so that the question in the form of fractions is the correct question. This module was developed for junior high school students in Indonesia; thus this module uses Indonesian grammar. The following is an example of a revised part of the module.

![Figure 3. Properties of addition operations before revision](image)
Figure 4. Properties of addition operations after revision

Figure 3 shows the writing of the properties of addition operations needs to be revised, because according to the validators, the use of bold letters in this section is too excessive. The validators suggested that it is only the nature of the operation that should be bold, other sentence statements do not need to use bold letters. The revised results can be seen in Figure 4.

Figure 5. Fractional algebraic questions before revision

Figure 6. Fractional algebraic questions after revision
Figure 5 shows the algebraic form of the fraction that needs to be revised, because according to the validators, the question is incorrect because it does not include the terms. The validators suggested that the fraction questions like in Figure 5 should include the conditions in order the questions become correct. The revised results can be seen in Figure 6.

4. Conclusion

Based on the average rating of the three validators on the four aspects of assessment, the results of the eligibility content 81.11%, linguistic 85%, presentation 82.5%, and graphical aspects 86.37%. The four aspects of the assessment are above 80%, which means that the module is categorized as very valid in every aspect of the assessment. Overall the average percentage obtained from experts’ assessment is 83.74%, it means that in general, the module is also categorized as very valid. Based on the results of experts’ assessment, the results show that the algebraic form module with living values education for junior high school students is categorized as very valid and feasible to be tested or continued at the implementation stage.

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