# THE DEVELOPMENT OF MATHEMATICS LEARNING MODULE ON THE SUBJECT OF THE PATTERN OF SEQUENCE NUMBER AND SERIES ON CLASS X STUDENTS OF SMK

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**ABSTRACT**

This research is motivated by the absence of a mathematical learning module on the material of sequence numbers and series in school. This study aims to develop the module of mathematical learning on the material of the pattern of sequence number and series for class X students of Vocational High School (SMK), which is used as independent teaching materials of the students. This research using the Research and Development (R&D) method with the ADDIE model consisting of five main stages: analysis, design, development, implementation, and evaluation. This study's subjects are material experts, media experts, and vocational school students in two schools: SMKN 1 Pleret and SMK Diponegoro Depok. The data collection method techniques using questionnaires. Simultaneously, the data analysis techniques using qualitative data are converted into quantitative data with a Likert scale. The research results showed that the development of mathematical learning modules included in good categories based on a questionnaire by a media expert with a score of 120. Average results by three material experts in excellent categories with a score of 86. The questionnaire responses of small class students obtained by 75,87 with very good categories and questionnaire responses of large class students were obtained by 74,87 with very good categories—the results based on the research that the mathematical learning module is proper to use in mathematics learning.

**Keywords**: Mathematical module, Self-taught Material, Pattern of the sequence number, and series.

## INTRODUCTION

Education has a very important role in the development and improvement of human resources. The existence of education makes humans more advanced, resilient, skilled, and educated. However, there is a problem faced by the world of education, namely the learning process's weakness, especially in mathematics. The mathematics learning process's weakness is shown by the learning process that leads to the ability to memorize information without being required to understand mathematical concepts. The mathematics learning process's weakness is shown by the learning process that leads to the ability to memorize information without being required to understand mathematical concepts. The general goal of giving mathematics at the primary education level and general education is to prepare students to use mathematics and mathematical thinking patterns in everyday life and learn various sciences (Soedjadi: 2000).

Mathematics is a branch of exact science and is systematically organized. In mathematics, the primary object studied is abstract. Basic objects include facts, concepts, operations or relationships, and principles. From that primary object can be arranged a mathematical pattern and structure. Mathematics teachers must try to reduce the abstract nature of the mathematical object so that students will quickly understand the mathematics they receive at school. One effort that can be done by the teacher is through mathematics learning that can build an understanding of the mathematical concept itself.

Based on the results of interviews with mathematics teachers at SMK N 1 Pleret and SMK Diponegoro Depok Yogyakarta, the availability of mathematics teaching materials is still limited when the learning process teachers only rely on Student Worksheets (LKS). While obstacles during the learning process take place are still often experienced by teachers. These obstacles include not all students taking notes on the material explained by the teacher. This will later hinder students from learning independently.

Some of these things underlie researchers to develop mathematics learning modules as teaching material. The developed module is a mathematical module that can be used as teaching materials in class

or learning for X grade students of SMK. This module was chosen because in terms of the appearance of the contents in the form of writing and illustrated images to help students learn independently and foster understanding of concepts in mathematics.

Based on this background, the following problems can be formulated: 1) How to develop a mathematics learning module on sequence and sequence patterns in class X students of SMK? 2) Does the development of the mathematics learning module on the subject line patterns and series meet the eligibility standards?

The objectives of this research are: 1) Develop a mathematics learning module on the sequence and series patterns in class X students of SMK. 2) It knows the feasibility of a mathematical module on the rank and sequence of class X vocational high school.

## METHODS

This research is a type of Research and Development (R & D) that uses the ADDIE model. Development research is a research method for developing a new product or perfecting an existing product. The product produced in this study is a teaching material in the form of a mathematics learning module on the subject line pattern and sequence numbers for grade X students of SMK. The development of mathematics teaching materials in the form of learning modules on sequential and sequential number patterns refers to the ADDIE development model with the following steps (Personal, Benny A: 2009).

1. Analysis. At this stage, the activity carried out is to analyze the needs of teaching materials to be developed so that the products developed will meet the target needs. The analysis process carried out is the analysis of teaching materials based on students' needs, curriculum, and characteristics.
2. Design. After the analysis phase is carried out, it is necessary to design the next desing. These researchers' design modules are tailored to the results of the stages conceptually.
3. Development. At this stage, the researcher concretizes the design results at the design stage. The draft that has been conceptualized is then developed with the following steps: writing a draft and validating the product's results to the material expert and the media expert.
4. Implementation. After the module is declared valid and feasible, the next module is printed as many times as needed. The module is then implemented in school learning activities. This trial was conducted by way of students using the module to learn the material pattern of sequences and sequences. The activity then continued with questionnaire filling conducted by students who had used the module. It aims to evaluate as a reference for revision so that the module becomes better.
5. Evaluation. From the implementation phase, modules need to be evaluated. Evaluations were obtained from students' questionnaires and teacher interviews. At the evaluation stage, the final revision of the product being developed is carried out. Based on the whole process, the module developed will be expected to be suitable for mathematics learning because it meets the quality aspects in terms of content and language feasibility.

The data analysis technique used in this study was to analyze each item of the questionnaire, both the material expert questionnaire, the media expert and the questionnaire for students who had been quantified through several stages, including the following.

Quantifying Data, data obtained through a questionnaire in the form of quantitative values will be converted into a cumulative value on a Likert scale, as in Table 1 below.

**Tabel 1.** Skala Likert

| Information | Score |
|---|---|
| SS (Strongly Agree) | 5 |
| S (Agree) | 4 |
| CS (Quite Agree) | 3 |
| TS (Disagree) | 2 |
| STS (Strongly Disagree) | 1 |

Sugiyono (2011:135)

From the data collected, the average is calculated using the formula:

$$\bar{X}_i = \frac{\sum_{i=1}^{n} Y_i}{m}$$

information:

$\bar{X}_i$: Average score per item

$\sum_{i=1}^{n} Y_i$: Average number of scores per item

m: Number of criteria items

Furthermore, the data obtained are converted into qualitative values based on ideal evaluation criteria as the table below.

**Table 2.** Criteria Criteria for the Ideal Assessment of Expert Material

| No | Quantitative Score Range | Calculation | Qualitative Category |
|---|---|---|---|
| 1 | $\bar{X} > \bar{X}_i + 1{,}80\ SB_i$ | $\bar{X} > 84$ | Very good |
| 2 | $\bar{X}_i + 0{,}60\ SB_i < \bar{X} \le \bar{X}_i + 1{,}80\ SB_i$ | $68 < \bar{X} \le 84$ | Well |
| 3 | $\bar{X}_i - 0{,}60\ SB_i < \bar{X} \le \bar{X}_i + 0{,}60\ SB_i$ | $52 < \bar{X} \le 68$ | Enough |
| 4 | $\bar{X}_i - 1{,}80\ SB_i < \bar{X} \le \bar{X}_i - 0{,}60\ SB_i$ | $36 < \bar{X} \le 52$ | Less |
| 5 | $\bar{X} \le \bar{X}_i - 1{,}80\ SB_i$ | $\bar{X} \le 36$ | Very less |

Widoyoko (2017:238)

**Table 3.** Criteria for Ideal Assessment Categories of Media Experts

| No | Quantitative Score Range | Calculation | Qualitative Category |
|---|---|---|---|
| 1 | $\bar{X} > \bar{X}_i + 1{,}80\ SB_i$ | $\bar{X} > 126$ | Very good |
| 2 | $\bar{X}_i + 0{,}60\ SB_i < \bar{X} \le \bar{X}_i + 1{,}80\ SB_i$ | $102 < \bar{X} \le 126$ | Well |
| 3 | $\bar{X}_i - 0{,}60\ SB_i < \bar{X} \le \bar{X}_i + 0{,}60\ SB_i$ | $78 < \bar{X} \le 102$ | Enough |
| 4 | $\bar{X}_i - 1{,}80\ SB_i < \bar{X} \le \bar{X}_i - 0{,}60\ SB_i$ | $54 < \bar{X} \le 78$ | Less |
| 5 | $\bar{X} \le \bar{X}_i - 1{,}80\ SB_i$ | $\bar{X} \le 54$ | Very less |

Widoyoko (2017:238)

**Table 4.** Criteria Criteria for the Ideal Assessment of Students' Responses

| No | Quantitative Score Range | Calculation | Qualitative Category |
|---|---|---|---|
| 1 | $\bar{X} > \bar{X}_i + 1{,}80\ SB_i$ | $\bar{X} > 71{,}4$ | Very good |
| 2 | $\bar{X}_i + 0{,}60\ SB_i < \bar{X} \le \bar{X}_i + 1{,}80\ SB_i$ | $57{,}8 < \bar{X} \le 71{,}4$ | Well |
| 3 | $\bar{X}_i - 0{,}60\ SB_i < \bar{X} \le \bar{X}_i + 0{,}60\ SB_i$ | $44{,}2 < \bar{X} \le 57{,}8$ | Enough |
| 4 | $\bar{X}_i - 1{,}80\ SB_i < \bar{X} \le \bar{X}_i - 0{,}60\ SB_i$ | $30{,}6 < \bar{X} \le 44{,}2$ | Less |
| 5 | $\bar{X} \le \bar{X}_i - 1{,}80\ SB_i$ | $\bar{X} \le 30{,}6$ | Very less |

Widoyoko (2017:238)

Information:

$\bar{X}_i$         = Ideal average

$\bar{X}_i$         = $\frac{1}{2} \times$ (ideal maximum score + ideal minimum score)

$SB_i$         = ideal standard deviation

$SB_i$         = $\frac{1}{6} \times$ (Ideal Maximum Score - Ideal Minimum Score)

$\bar{X}$         = Empirical score (Average score)

Ideal maximum score = number of criteria items $\times$ the highest score

Ideal minimum score = number of criteria items $\times$ the lowest score

## RESULTS AND DISCUSSION

The trial data in developing the mathematics learning module on the subject line pattern and series for class X students of SMK is obtained based on the steps in the ADDIE method, namely Analysis, Design, Development, Implementation, and Evaluation. Based on the data analysis technique used, the

data obtained from three assessments, namely the assessment of material experts, media experts, and students' responses.

1.  Module quality analysis in terms of material is carried out by material experts, namely Uswatun Khasanah, S. Si, M.Sc., who is a lecturer in Mathematics Education at Ahmad Dahlan University, Drs. Suismanto, M.Pd. As a mathematics study teacher in class X SMK Negeri 1 Pleret and a teacher in mathematics study in class X SMK PIRI 1 Yogyakarta, namely Dita Dwigus Wijayanti, S.Pd. The results of the calculation of the quality of the mathematics learning module on the subject of sequence and series numbers for class X vocational students by material experts can be seen in Table 5 as follows.

**Table 5.** Results of the Eligibility Questionnaire Calculation for Material Expert

| No | Evaluator | Score | Mean | Module Quality Categories |
|---|---|---|---|---|
| 1 | Uswatun Khasanah, S. Si.M. Sc. | 90 | 90 | Very good |
| 2. | Drs. Suismanto, M.Pd. | 81 | 81 | Good |
| 3 | Dita Dwigus Wijayanti, S.Pd. | 87 | 87 | Very good |
| Amount | | 258 | 86 | Very good |

From Table 5, it can be seen that the average score of material expert judgments is 86. The results indicate that modules developed in terms of material are included in the Very Good category.

2.  Module quality analysis in terms of appearance is carried out by media experts, namely Anggit Prabowo, M.Pd. Who is a lecturer in Mathematics Education at Ahmad Dahlan University. The results of the calculation of the module quality by media experts can be seen in Table 6 below.

**Table 6.** Results of the Eligibility Questionnaire Calculation for Media Experts

| No | Evaluator | Score | Mean | Module Quality Categories |
|---|---|---|---|---|
| 1 | Anggit Prabowo, M.Pd | 120 | 120 | good |

From Table 6, it can be seen that the average score of the assessment of media experts is 120. This shows that the module developed is included in the Good category.

3.  Module quality analysis in terms of student responses is carried out by students of SMK Negeri 1 Pleret and SMK Diponegoro Depok Yogyakarta. The results of the calculation of the quality of the module by the responses of students can be seen in Table 7 below.

**Table 7.** Calculation of Student Questionnaire Responses

| No | Activity | Average score | Module Quality Categories |
|---|---|---|---|
| 1 | Trial of Small Class Products | 75,87 | Very good |
| 2 | Trial of Large Class Products | 74,87 | Very good |
| Mean | | 75,37 | Very good |

Table 7 shows that students' responses to modules included in the Very Good category are shown with an average score of 75.87 in small class product trials and included in the Very Good category indicated by a score of 74.87 in large class trials. From the two tests conducted, it can be concluded that the modules developed are included in the Very Good category with an average score of 75.37.

**CONCLUSION**

Based on the research results on the development of teaching materials in the mathematics learning module on the subject line pattern and series for students of class X vocational high school students that have been done, the following conclusions are obtained:

1.  This research has developed teaching material in the form of a mathematics learning module on the subject line pattern and series for students of class X vocational high school using the ADDIE development model.

2. The level of feasibility of teaching materials in the form of mathematics learning modules on the subject of sequences and sequence numbers for X grade students in terms of aspects of the material included in the excellent category with an average score of the results of the assessment of material experts is 86 and reviewed from the aspect of module display included in the good category with an average score of 120 votes by media experts.

3. Students 'responses when using mathematics learning module teaching materials on the subject of the sequence of sequences and series in terms of students' responses are included in the category of Very Good with an average score of 75.37

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