

THE DEVELOPING MATHEMATICS MODULE OF SOCIAL ARITHMETIC BY USING SCIENTIFIC APPROACH FOR STUDENT OF GRADE VII

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ABSTRACT

Limited teaching materials are one of the problems that affect the achievement of learning objectives. Teaching materials that can help the student to learn independently is a module. This research is development research that aims to produce Mathematics Module of Social Arithmetic by using a Scientific Approach for Student of Grade VII SMP/ MTs (Junior High School) and to know the module quality that developed and worthy of use in Mathematics learning. This research uses Research and Development developed by identifying the potential and problem, collect the information, designing the product, validation of product design, revise product design, product trial stage, and revise the product. The subject in this research and development of the module are material experts, media experts, and students. The Mathematics Module, using the scientific approach, is developed based on five learning steps: observing, questioning, collecting information, reasoning, and communicating. This product has been through the revision step based on the suggestion and feedback from media experts, material experts, and student's responses to the module. The result of the research shows that the Mathematics Module of Social Arithmetic, using the Scientific Approach for Student of Grade VII SMP/ MTs (Junior High School), has good quality from criteria of validity. Based on the assessment from material experts obtained an average score of 96,67, which fulfills the criteria very good. From media, experts obtained average score 69, which fulfills the criteria well, and the student's response showed that the quality of the module is excellent, with an average score of 86,29. Based on the research, the Mathematics Module of Social Arithmetic using the Scientific Approach for Student VII Grade of SMP/ MTs(Junior High School) is worthy of use in Mathematics Learning.

Keywords: Module, Social Arithmetic, Scientific Approach

INTRODUCTION

Learning resources are one important component of learning. One source of learning is teaching material. Understanding teaching materials, according to Majid, Abdul (2011: 173-174), Teaching materials are all forms of materials used to help teachers or instructors in carrying out teaching and learning activities. Teaching materials can be either written or unwritten materials. Unwritten teaching materials in the form of sound recordings (audio), sound recordings of images (audiovisual), and interactive teaching materials. Written teaching materials can be in the form of books, modules, brochures, leaflets, LAS, handouts, wallcharts, and so on.

The module is one of the written teaching materials used in the learning process. The module contains materials that students can study independently and contains exercises related to the material and packaged interestingly and systematically. The function of the module is as a sequence to train the independence of students in understanding learning material. The content or presentation material of a module must be presented in full and discussed through the presentations so that students feel they understand enough about the particular field of study from the learning outcomes through the module.

Based on the results of the interview with mathematics teacher SMP 15 Yogyakarta and MTs Muhammadiyah Karangajen obtained information that both schools have implemented the curriculum 2013. In class VII mathematics study, teachers used the government's distributed textbook. The mathematics teachers in both schools have not yet developed a module to cope with student learning difficulties.

Interviews are also conducted with several students at SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangkajen. From the interview, the information learned that mathematics was a painful lesson. Also, textbooks used today is still difficult for students to understand. One of the materials that are difficult to understand by students is social arithmetic. Students expect a mathematical module of social arithmetic material with an attractive look, and also the material in the module is easy to understand.

To make it easier for students to learn mathematics, other teaching materials can be added with mathematical modules so that students can study independently. In drafting the module required an approach to produce a module that suits the needs of learners. A scientific approach is a learning approach applied to the 2013 curriculum. In scientific approaches, learners must participate in learning activities. Learning with a scientific approach is expected to form the maximum attitude, skills, and knowledge of learners. Based on the background, it can be formulated the following problems:

1. How to develop the mathematical modules of social arithmetic material with a scientific approach for grade VII students SMP/MTs?
2. Is the mathematical module of social arithmetic material with a scientific approach for students of grade VII SMP/MTs worthy of use by students in SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangkajen?

The aim of this study is:

1. Develop the mathematical modules of social arithmetic material with a scientific approach to grade VII students SMP/MTs
2. To know the feasibility of the mathematical module of social arithmetic material with a scientific approach for grade VII students SMP/MTs.

Some research that is relevant to this development is research conducted by Puspa Ratna Dewi (2015) titled Development of Mathematical modules with scientific approaches to trigonometric materials for grade X SMA/MA students and research Conducted by Landrhetha Chintya Pratiwi Suwito Puteri (2016) under the heading The development of an accounting module based on scientific approaches as teaching materials supporting the implementation of curriculum 2013 on the subject matter of Class XI in SMK Negeri 1 Ngawi.

Based on research studies, this research is relevant: the development of teaching materials in the form of modules with scientific approaches. However, there are a few different things from this research that is in the first research developing mathematical modules with trigonometric material. In contrast, the second research develops an accounting module with the receivables material.

Of the two studies above showed a positive impact, so the researcher researched the development of the mathematical modules of social arithmetic material with a scientific approach to student's classes VII SMP/MTs.

In Suherman, Erman, et al. (2003:16-17), There are some opinions of experts who define the mathematical sense.

- a. In his mathematical dictionary, James and James say that mathematics is a science of logic about form, arrangement, magnitude, and concepts related to one another with numerous amounts divided into three areas, namely Algebra, analysis, and geometry.
- b. Johnson and Rising in his book say that mathematics is a mindset of thinking, organizing patterns, logical proving, mathematics is a language that uses a carefully defined term, clearly and accurately, its representation With a symbol and solid, more in the form of symbol language about the idea of sound.
- c. Reys, DKK. In his book, mathematics is a study of patterns and relationships, a way or a pattern of thinking, an art, a language, and a tool.
- d. Kline, in his book, says Anyway, that mathematics is not self-knowledge that can be perfect because of himself. However, the existence of mathematics is mainly to help people understand and strengthen the problems of social, economic, and nature.

So, mathematics is a science of logic, a symbol language about ideas, a study of patterns and relationships, and a tool to help people understand and strengthen social, economic, and natural problems.

According to Suherman, Erman et al. (2003:55), the mathematical understanding of the school is as follows. School mathematics is math taught in schools, namely mathematics taught in elementary education (Elementary and Junior High School) and secondary Education (SLTA). It is explained that the mathematics of the school consists of the selected parts of mathematics for the development of developing skills and shaping personal and guided on the developments of SCIENCE and technology. Suherman, Erman, et al. (2003:56) also mentioned that, the function of mathematical subjects as tools, mindset, and science. These three functions should be used as a reference for mathematics learning in schools. Based on the understanding and function of school mathematics, It can be concluded that school mathematics is mathematics taught in schools as one of the subjects, which plays an active role in the formation of mindset, delivered Hierarchical as a science that blends on the development of IPTEK.

According to Uno, Hamzah B (2012:130), The fact of learning mathematics is mental activity to understand the meaning and relationships and symbols and then set it to a real situation. Meanwhile, according to Ruseffendi, E.T. (1993:37), Learning mathematics is learning about the concepts and structures contained in the discussion learned and looking for relationships between concepts and structures. The same. Based on the above definition, it can be concluded that mathematics is an activity involving observation, data collection, investigation, concept understanding, and problem-solving, therefore learning mathematics is an activity to understand Relationships between simple mathematical elements become a new set of more complex so that learning mathematics must go through an easy or straightforward concept towards a more abstract or complicated concept.

According to the Ministry of National Education Directorate General of Primary and secondary education management in the Teaching Materials Development Guide (2008:7), Teaching materials are all forms of materials used to assist teachers/instructors in implementing Teaching and learning activities. The material in question may be written or unwritten material. Based on the explanation above, it can be concluded that the teaching material is any form of material either in the form of written material or unwritten material that is arranged systematically to assist the teacher in delivering the teaching materials to create the atmosphere of Teaching and learning that allows students to learn. Unwritten teaching materials can be sound recordings (audio), Image sound recordings (audiovisuals), and interactive teaching materials. Written teaching materials can be books, modules, brochures, leaflets, student activity sheets (SAS), handouts, wallcharts, etc. One of the written teaching materials used as aids in the learning process is the module.

In the guidance of teaching materials, Development (2008:20) of the module is one of the printed materials that can be used as aids in the learning process. A module is a book written to study independently without or with the teacher's guidance. According to Prastowo, Andi (2013:107-108), the module has the following functions as one form of teaching materials.

- 1) Self-taught materials.
- 2) Substitute for educator function.
- 3) Evaluation tool.
- 4) Referral material for students.

While the purpose of drafting or doing modules in Prastowo, Andi (2013:108-109):

- 1) For learners to learn independently without or with the guidance of educators (who are minimal)
- 2) So that the educator's role is not very dominant and authoritarian in the learning activities.
- 3) Train the honesty of learners.
- 4) They are accommodating different levels and speeds of learner's learning.
- 5) To allow learners to measure the level of mastery of the material that has been studied.

Based on the explanation above, it is concluded that the module is a systematic type of printed teaching material that includes a planned learning experience designed to help students learn independently to master the learning objectives. Modules serve as self-taught materials to improve student's ability, explain the material well and easily understand, can be used to measure the level of mastery over the material that has been studied, and the reference material for Learners. The purpose of the learning module is to be designed to allow students to study independently with or without teacher

guidance, so that the role of educators is not very dominant, accommodating different levels and the pace of student learning, and for learners Able to measure the mastery of the material that has been studied.

METHODS

The research uses research models called research and development. Sugiyono (2014:407) mentions that Research and Development is a research method used to produce a specific product and test its effectiveness. The research focuses on the development of the mathematical modules of social arithmetic material with a scientific approach to grade VII students in SMP/MTs.

This research procedure refers to Sugiyono's development model. The research development steps are as follows.

1. Potential and problems. The potential has a learning motivation with high students. In contrast, the problem has the limitation of modules that are owned so students cannot perform the learning activities with the maximum.
2. Data Collection. Once the problems can be demonstrated factual and up to date, then the next need to be collected various information that can be used as material for the planning of certain products that are expected to resolve the problem.
3. Product Design. The result of the research and development activities is a new product design, complete with specifications. Product design should be embodied in images or charts to be used as a grip to assess and make it.
4. Design Validation. Design validation is an activation process for assessing product design. Product validation can be done by presenting some experts or experts that each expert is required to assess the design so that it can further be known to its shortcomings and weaknesses. Validation is adjusted to the evaluation, which corresponds to the Ministry of Education's evaluation component.
5. Design Revision. Once the design is validated by an expert and known for its shortcomings and weaknesses, further researchers who develop the product have corrected the shortcomings and weaknesses of the product design that have been validated.
6. Product Trial. The product test is done to know the suitability of the developed product goes as expected. Through this activity, researchers also gather information for product improvement. The product test is done twice in small and large classes.
7. Design Revision. The revision of the product aims to overcome the shortcomings and weaknesses in the module products that have been tested in the first Test with limited samples and to improve the module to be more productive.
8. Product results. Product results are not done in this research, because of the limited time, cost, and energy, the development of mathematics module of social arithmetic material with a scientific approach for students of grade VII SMP/MTs, only limited to product revisions.

The research was conducted in SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangajen. The subject in this study was a grade VII student at SMP Negeri 15 Yogyakarta with 33 students and MTs Muhammadiyah Karangajen with 30 students. Students provide assessments and suggestions for improvement of the module. The instrument used to collect data on this research is a poll. The type of poll used is a poll checklist. The poll has been developed in 3, namely the Expert Assessment questionnaire, media expert Assessment questionnaire, and Student Response Assessment questionnaire. The poll is given at the evaluation stage in the activity of validation and testing of products. At the validation stage, a material expert assessment poll is provided to the material members to provide assessment and input to the module in terms of materials covering several aspects of content eligibility, linguistics, serving, and graphic. The assessment of media experts is given to the media experts to provide assessment and input to the modules in terms of media that includes several aspects such as the aspect of the dish, the aspect of the language, and the aspect of the graphic. As for the product test, a student response poll is given to students after they learn the module. The data analysis technique done is to use the Likert scale presented in table 1, which is as follows.

Table 1. Likert Scale

Information	Score
Very agreed (very good)	5
Agreed (good)	4
Hesitant (Enough)	3
Disagree (less appropriate)	2
Strongly disagree (not appropriate)	1

From the data collected, in Sukarjo (2006: 55) the average is calculated using the formula:

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

Information:

\bar{x} : mean score

$\sum_{i=1}^n x_i$: total score

n : number of evaluators

Next, determine the average criteria in the guidelines for the ideal assessment criteria presented in Table 2 as follows.

Table 2. Criteria for Ideal Rating Categories

No	Range of scores (i) quantitative	Category
1.	$\bar{X} > (\bar{M}_i + 1,8 SB_i)$	Very Good
2.	$(\bar{M}_i + 0,6 SB_i) < \bar{X} \leq (\bar{M}_i + 1,8 SB_i)$	Good
3.	$(\bar{M}_i - 0,6 SB_i) < \bar{X} \leq (\bar{M}_i + 0,6 SB_i)$	Enough
4.	$(\bar{M}_i - 1,8 SB_i) < \bar{X} \leq (\bar{M}_i - 0,6 SB_i)$	Less
5.	$\bar{X} > (\bar{M}_i - 1,8 SB_i)$	Very Less

Information:

\bar{X} : mean score

M_i : mean deals

SB_i : ideal standard deviation

RESULTS AND DISCUSSION

Test Data on the development of the mathematics module of social arithmetic material with a scientific approach to class VII SMP/MTs includes potential and problems, data collection, product design, design validation, design revisions, product testing, and revision Products. Based on the data analysis techniques used, the data obtained from the expert assessment of the material, the assessment of media experts, and the student response test are processed. The results are as follows:

Assessment of the results of the eligibility poll by material experts can be seen in table 3.

Table 3. The calculation result of the expert eligibility poll

No	Material experts	Score	Qualitative Data Criteria
1.	Dra. Sumargiyani, M.Pd.	109	Very Good
2.	Sukrisna, S.Pd.	98	Very Good
3.	Vika Rosana Alpha, S.Pd.	83	Good
	Total	290	Very Good
	Mean	96,67	Very Good

From table 3 can be seen that the average score of expert assessment results is 96, 67. The results are Products that the module developed in terms of a shoe is included in the category very good. Based on the assessment of the three experts, releasing aspects in the module has very good criteria. However, the

aspect of the content feasibility obtained the highest valuation compared with the linguistic aspect, servings, and the graphic is 91, 11%.

Assessment of the results of the eligibility poll by media experts can be seen in table 4.

Table 4. The calculation result of Media expert eligibility poll

No	Material experts	Score	Qualitative Data criteria
1.	Anggit Prabowo, M.Pd.	67	Good
2.	Taufik Ruyadi, S.T.	73	Very Good
3.	Andriyanto, S.T	67	Good
	Total	207	Good
	Mean	69	Good

From table 4, It can be seen that the average media expert scoring score is 69. The results showed that the modules developed are seen in terms of media belonging to the excellent category. Based on the assessment of the three media experts, all aspects of the module have good criteria. However, the presentation aspect is getting the highest valuation compared to the aspect of the linguistic and the graphic of 82.67%.

The student response test for mathematical module products is based on the poll provided and filled by students at the time of product I trials for small classes and test products for large classes. The results of the student response poll on the mathematical modules can be seen in table 5:

Table 5. Student Response Poll Results

No	Activity	Mean Score	Categories
1	Product Trial	85,80	Very Good
2	Test Products	86,79	Very Good
	Mean Score	86,29	Very Good

Table 5 shows that the student's response to the very good module was demonstrated with an average score of 85.80 on the product test and the test product with an average score of 86.79 included in the category well. Of the two tests, it can be concluded that the mathematical modules developed in the excellent category are indicated by an average of 86.29 and are worth use in learning. Based on the assessment of the student's response to the product test and product test, all aspects of the module have excellent criteria. However, the serving aspect is gaining the highest judgment compared to the linguistic, graphic, and benefits aspects of 86.91%.

CONCLUSION

Based on the research results on the development of mathematical modules of social arithmetic material with the scientific approach that has been done, obtained the following conclusions:

1. Development of mathematics module of social arithmetic material with the scientific approach is done through several stages, namely potential and problems, data collection, product design, design validation, design revision, product trial, and product revision.
2. Feasibility module. Mathematical modules with a scientific approach that have been developed are worthy of use in learning based on expert material, media experts, and the response of class VII SMP Negeri 15 Yogyakarta and MTs Muhammadiyah Karangajen. The results of the assessment module by material experts acquired an average score of 96.67 with the criteria perfect, the results of the module assessment by the media experts acquired an average score of 69 with the criteria good. In contrast, the results of the assessment of the module by the student response obtained. The average score of 86.29 is included in the excellent category.

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