ANALYSIS OF TEACHING MATERIAL NEEDS FOR SEQUENCES AND SERIES TO IMPROVE SMA/MA STUDENTS' MATHEMATICAL PROBLEM SOLVING CAPABILITY

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Abstract
Teaching materials are one of the supporting components for achieving mathematical problem solving abilities. This research aims to analyze the need for teaching materials regarding sequences and series to improve mathematical problem solving abilities for class at SMAN 15 Pekanbaru. Data collection through interviews and questionnaires uses instruments that contain indicators, namely learning resources, content of teaching materials, and needs for teaching materials. The data analysis used is Miles-Huberman Interactive Analysis, which consists of data condensation, data display and conclusion drawing. The results of this research indicate that the teaching materials used in learning have shortcomings, namely: the teaching materials do not use a certain approach so that the teaching materials cannot improve mathematical problem solving abilities; material is received by memorization; teaching materials are less attractive, not contextual, unclear and difficult to use if there is no teacher explanation; teaching materials cannot make students active; and teaching materials cannot yet be called teaching materials because the constituent components are still lacking. The teacher stated that learning using teaching materials was better than just using textbooks. Based on the results of the research, it is hoped that it can be followed up to overcome students' problems in using teaching materials designed by teachers and developing teaching materials on sequence and series material which can improve students' mathematical problem solving abilities

Keywords: Needs Analysis, Problem Solving, Teaching Materials

INTRODUCTION
Problem solving skills are one of the characteristics of 21st century learning. Problem solving skills are the initial skills for solving problems that involve logical, systematic and critical thinking. Problem solving skills play an important role in formulating concepts and the
beginning of students' success in solving mathematical problems (Mariam et al., 2019).

Problem solving skills can enable students to construct problems they receive creatively and critically (Simanungkalit, 2016). Problem solving is at the heart of mathematics learning because the skill emphasizes the development of one's thinking skills. Problem solving will improve intellectual power in solving difficult problems (Faizah & Widyastuti, 2021; Fadilah & Hakim, 2022). By solving problems, it is possible for students to gain experience using previously possessed skills. The importance of developing problem solving abilities in learning is inversely proportional to reality. Students' problem solving abilities are still lacking (Lestari & Rosdiana, 2018; Luthfia & Zanthy, 2019; Muslihah & Suryaningrat, 2021; Lusiana et al., 2022; Batubara & Reflina, 2023).

Students' low mathematical problem solving abilities are caused by students not being used to working on non-routine problems (Cahyadi, 2019; Rambe & Afri, 2020; Fitri & Kartini, 2022; Lestari et al., 2022; Sriwahyuni & Maryati, 2022). Students lack mastery and are not optimal in solving problems (Rambe & Afri, 2020). Students' lack of mastery in solving problems can result in the learning objectives not being achieved.

Sequences and series are one of the materials that require mathematical problem solving abilities because they have various solving methods and are presented in the form of contextual problems (Pirmanto et al., 2020; Rambe & Afri, 2020).

In reality, students' mathematical problem solving abilities in sequences and series material are still relatively low (Sastri et al., 2019; Damayanti & Kartini, 2022). The statement that students' mathematical problem solving abilities in sequences and series material can also be proven by the results of students' tests at SMAN 15 Pekanbaru. Students have difficulty and make many errors on problem-based questions.

Based on the results of the questionnaire responses to the analysis of teaching material needs for students at SMAN 15 Pekanbaru, students stated that they had difficulty in the case of arithmetic series and geometric series. This is in line with research conducted (Islahiyah et al., 2021). The cause of low problem solving abilities in line and series material is found in the indicators for interpreting the results of problem solving. Students do not interpret the calculation results obtained (Damayanti & Kartini, 2022).

Students are also used to working on convergent problems, which makes it difficult for students to work on problems that require another perspective to solve them and students also tend to memorize formulas (Islahiyah et al., 2021).

Another cause of low problem-solving abilities is that the teaching materials used in learning do not support improving problem-solving abilities. This was obtained from interviews conducted with three teachers from SMA Negeri 15 Pekanbaru and SMA Negeri 1 Reteh. The teacher stated that the teaching
materials used in learning were in the form of modules designed by the teacher himself with a summary of the material, examples and practice questions without paying attention to mathematical problem solving indicators. The material, examples and exercises presented are only a summary of the material obtained from package books prepared by the government and other sources such as the internet.

The teaching materials used by teachers are still minimal, with a narrative writing style but are not communicative, are very dense and do not have a mechanism for collecting reader feedback, making it difficult for students to understand sentences in the teaching materials. Teaching materials are defined as written and unwritten materials used in the learning process (Daryanto & Aris, 2014; Padliani et al., 2019; Hanifah & Nuraeni, 2020; Fitriana et al., 2022). Teaching materials help in understanding the material easily and can be used independently for learning. Teaching materials can be used as a component that can help students learn smoothly in understanding the material. (Mustafa & Efendi, 2016; Nurhairunnisah & Suwarjo, 2018). Teachers and students will be helped in understanding the material because it is easier to convey the material if you use teaching materials.

Teaching materials can be used by teachers and students to improve the learning process, the teaching materials in question can be written or unwritten materials (Cahyadi, 2019; Ma et al., 2021; Alvariani & Sukmawarti, 2022; Mufidah et al., 2022). From the statements above, it can be concluded that teaching materials cover all subjects in order to convey learning messages and assist teachers/instructors in carrying out teaching and learning activities in the classroom.

One indicator of problem solving is creating a mathematical model of a real situation and students can solve it (Utami & Cahyono, 2020). Thus, the development of teaching materials whose presentation is directed at problem-solving competencies is important for teachers to carry out. The reason is that problem-based learning is learning that confronts real situations to begin learning (Davida et al., 2020).

This research will explain the analysis of the need for mathematics teaching materials to improve problem solving abilities. Teaching materials that suit the needs of high school students regarding sequences and sequences need to be developed. It is hoped that the results of this research can provide initial information for the development of mathematics teaching materials to improve mathematical problem solving abilities in sequences and series.

**METHOD**

This research is a qualitative descriptive study which aims to present the need for teaching materials used by students. The research subjects involved three teachers from SMA Negeri 15 Pekanbaru and SMA Negeri 1 Reteh and 25 students at SMAN 15 Pekanbaru. The choice of these two schools was due to problems faced by the schools related to the teaching materials used. The teaching materials
used have not been able to improve students' mathematical problem solving abilities. Data collection techniques using interviews and questionnaires. Data collection through interviews and questionnaires uses instruments that contain indicators, namely learning resources, content of teaching materials, and needs for teaching materials. Interviews are conducted to find the problems to be researched. Questionnaires are used to obtain data about the learning resources used by students, the content of teaching materials and the need for teaching materials required by students. The data analysis used is Miles-Huberman Interactive Analysis, which consists of data condensation, data display, and conclusion drawing.

The stages of data analysis in this research are as follows: (1) conducting interviews with teachers at SMA Negeri 15 Pekanbaru and SMA Negeri 1 Reteh to obtain data related to the analysis of teaching material needs for rows and rows; (2) after collecting data through interviews, the data that has been obtained is analyzed using an analysis that sharpens, categorizes, directs, removes what is not necessary, and organizes the data in such a way that final conclusions can be drawn; (3) describe the data that has been classified taking into account the research focus and objectives; (4) make a final analysis in the form of a final research results report. The results of data analysis will be used to develop teaching materials on sequences and series.

RESULTS AND DISCUSSION

Source of Learning

Interviews were conducted with three teachers from two schools, namely SMA Negeri 1 Reteh and SMA Negeri 15 Pekanbaru. From interviews, information was obtained that the teaching materials used in learning were government textbooks and teacher-designed teaching materials. Textbooks are obtained from the government based on the independent curriculum and the teaching materials used are designed by the teachers themselves which contain material summaries, example questions and practice questions.

The teaching materials created by teachers at SMA Negeri 1 Reteh and SMA Negeri 15 Pekanbaru are sourced from textbooks and the internet. The teacher stated that the teaching materials used in learning are called teaching modules. However, this statement is different from the components in teaching materials in the form of teaching modules.

Teaching materials in the form of modules consist of at least seven components, namely; (1) learning objectives; (2) evaluation sheet; (3) the position and function of the module in the broader program unit; (4) student activity sheets; (5) student worksheets; (6) key to student sheets; (7) guidelines for teachers (Nurdyansyah & Mutal'lah 2015).

From the teacher's statement, it can be concluded that the teaching materials created cannot be said to be teaching materials because the components of the teaching materials are not yet complete. The constituent components that are still lacking in teaching materials made by teachers are learning objectives, position and function of modules, key worksheets and guidelines for teachers. Apart from
the constituent components which are still incomplete, the problems presented in the teaching materials are not contextual so they cannot improve students' problem solving abilities.

The teaching materials designed by Reteh 1 Public High School teachers cannot yet be said to be teaching materials. The systematics of the designed teaching materials are not in accordance with the systematics of the actual teaching materials. The systematic teaching materials developed by Kopertis VI consist of (1) foreword; (2) table of contents; (3) introduction (brief description, basic competencies, indicators and learning objectives); (4) presentation (description of material, example questions, exercises and summary); (5) closing (evaluation & answer key, follow-up); and (6) bibliography (Mustafa & Efendi 2016)). The results of interviews and analysis of student questionnaires regarding active learning in learning can be seen in Figure 1 below.

![Figure 1. Student activeness in using teaching materials](image)

From the results of the interviews, information was obtained that rows and series material is one of the materials related to everyday life. In reality, teachers do not take advantage of this to improve students' mathematical problem solving abilities. This can be shown in the teaching materials created. The teaching materials do not contain problem solving indicators so that students state that it is difficult to solve problems on sequence and series material in the test questions. Teachers do not relate the material to students' experiences so that students are less able to construct the ideas they have. The teaching materials made by teachers are still simple because they do not use a learning approach so that the material obtained by students is memorized rather than finding their own concepts.
from the teaching materials used.

Material received by rote will cause learning to be less meaningful. In fact, using the right approach to learning will make teaching materials play an important role in learning (Mufidah & Susanto, 2022).

Needs for Teaching Materials

The results of the interview showed that the teacher stated that students got better grades if they used the teaching materials they made rather than just using textbooks. This statement was obtained from the results of reviewing previous material, namely exponents and roots, using only textbooks. The results of the test on exponent material showed that 35% of students got a score of more than 75. The teacher also stated that there was a need for teaching materials that were more interesting than the teaching materials he had made. It is recommended that teaching materials be equipped with examples and practice questions that are routine, non-routine and problem solving.

Students stated that they needed teaching materials about sequences and series with explanations of complex material. Furthermore, the students suggested that the practice questions should be equipped with answer keys available in the teaching materials so that students can correct answers to the questions. The questionnaire filled out by 25 students contained three indicators, namely learning resources, the content of the teaching materials, and the need for teaching materials which have been completed by students.

The results of the questionnaire showed that 80% of students stated that another obstacle they felt when using teaching materials from teachers was that the content of the teaching materials was too short because the explanation of the material was not clear enough, there were also not enough examples and practice questions. The explanation of the material is not clear because the teacher presents material on sequences and series, only general formulas are used without complex explanations. This results in the concept of sequences and series being less mastered by students.

Based on the results of the questionnaire given, 70% stated that students had difficulty using the teaching materials due to several factors, namely there were not enough examples and they were not contextual, the summary of the material was not understandable if it was not explained by the teacher first, and the teaching materials were difficult to use if there was no teacher explanation. Teaching materials are not equipped with contextual problems so that when students are faced with contextual problems, students have difficulty answering.

Test scores will be taken on September 24 2022 at SMA Negeri 15 Pekanbaru on rows and series material. The test questions consist of eight questions with details of five routine questions and three non-routine problem solving questions.

Table 1 shown the student test scores on sequence and series material.
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Table 1. Student Test Results on Sequences and Series Material

<table>
<thead>
<tr>
<th>No</th>
<th>Completeness</th>
<th>Number of Students</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Complete ≥ 75</td>
<td>11</td>
<td>44%</td>
</tr>
<tr>
<td>2.</td>
<td>Not Complete &lt; 75</td>
<td>14</td>
<td>56%</td>
</tr>
<tr>
<td>Quantity</td>
<td>25</td>
<td>100%</td>
<td></td>
</tr>
</tbody>
</table>

Based on the test scores in Table 1, it was found that 14 students had not reached the KKM with a percentage of 56% and the remaining 11 students had reached the KKM with a percentage of 44%. The teacher stated that students had difficulty solving contextual problems. This was stated in research conducted by Ningrum & Rizky (2018) which stated that students had difficulty completing problem solving questions on sequences and series because the concepts were not mastered, calculations were wrong and lack of accuracy. Many students do not work on the sub-materials of arithmetic series, geometric series and infinite series. In accordance with the results of research by Pirmanto et al. (2020) which stated that students had difficulty working on questions using arithmetic and geometric series material. Based on the preliminary study, it is hoped that it can be followed up to develop teaching materials on sequences and series that can improve students' mathematical problem solving abilities.

**CONCLUSION**

Based on the research results and discussion, it can be concluded that the teaching materials designed by teachers cannot be said to be teaching modules and teaching materials because they still lack several components that make up teaching materials and are less attractive due to the lack of images supporting the material and example questions. Teaching materials only contain a summary of the material, are not contextual and do not use a particular approach so that the material is obtained by students by memorizing rather than understanding the concept.

Based on the explanation regarding the problems of using teaching materials designed by teachers, it is hoped that the development of teaching materials on rows and series can overcome the problems experienced by students and teachers and can improve students' mathematical problem solving abilities.

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