# Development of Materials to Improve the Ability of Resolution and Disposition Mathematic Through Mathematical Approach Realistic in Class V Sd Negeri Lamsayeun Aceh Besar

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#### Abstract

This study aims to determine: (1) validity, practicality and effectiveness of teaching materials developed through realistic mathematical approach to improve problem solving skills and mathematical disposition (2) improvement of problem solving and mathematical disposition by using teaching materials developed through mathematical approach Realistic. This type of research is development research using 4-D development model (define, design, develop, disseminate). Subjects in this study were all students of grade V at SD Negeri Lamsayeun Aceh Besar. And Objects in this study is the feasibility of teaching materials that are done to improve problem solving skills and mathematical dispositions. For the feasibility of the teaching material is viewed in terms of validity, practicality, and effectiveness. Data were collected using 3 types of instruments: assessment sheets, questionnaires, test methods. The teaching materials that have been validated by the ahi show that the revised textbooks have been valid and can be used in the learning process. The result of the learning material material is 92.75%, the linguist shows the value of 98.25%, the media expert shows the value of 97.50% and the teacher validation shows that 90%. The result of LKS validation shows that the learning material expert is 95,50%, the linguist shows the value of 92,75%, the media expert shows the value of 93,75% and the validation of the teacher shows the value of 85%. The effectiveness of teaching materials based on realistic approach in improving the ability Problem solving and mathematical disposition has been effectively used in mathematics learning, which includes: a. 85% of students who took the problem solving test obtained a minimum score of 75. b. Achieving the ideal percentage of student activity time. C. Achievement of the ability of teachers in managing learning has been good. D. At least 80% of the many subjects studied provide a positive response to the composition of learning devices based on a realistic mathematical approach developed. Problemsolving abilities and mathematical dispositions in students taught by using teaching materials through realistic mathematical approaches have increased. Student responses to the components of learning materials and learning activities are positive

Keywords: Teaching Materials, Problem Solving Abilities, Mathematical Disposition, and Realistic Mathematical Approach

# 1. Preliminary

The wave of modernization by all developing countries including Indonesia has brought diverse implications in all aspects of life, especially on social conditions. Education for most people, means trying to guide children to resemble an adult. Education means to produce, to create, though not much, even if a creation is limited by comparison with the creation of another.

According to Jean Piaget in Irfan (2007: 78) that education as a liaison on both sides, on the one hand the growing individual and on the other social, intellectual and moral values are the responsibility of educators to encourage the individual. Education as one part of the social aspect has a dual position, namely the strategic and critical position. Called strategic because education is able to live consistently overcoming the threats and challenges of the future. The point is that education must be futuristic or future-oriented. In addition, education is said to occupy a critical position because education must take adaptive and adoptive steps to face future challenges.

Learning process occurs because of the interaction between a person with his environment. Therefore, learning can happen anytime and anywhere. One sign that a person has learned is a behavioral change in the person caused by changes in the level of knowledge (cognitive), attitude (affective) and skills (psychomotor).

Mathematics is taught from elementary school (SD) to college. This is because the quality of teaching mathematics has a very dominant role for the progress of the nation. Sanjaya (2011: 209) states "in the elementary mathematics learning, reinvention is expected to occur (reinvention). Reinvention is finding an informal settlement in classroom learning ". Therefore, in learning mathematics there must be a link between the previous student's learning experience with the concept to be taught.

Mathematics education in Indonesia, seems to need reform, especially in terms of learning. This is because

until now so many students complain and assume that math is very difficult and is a scourge, consequently they do not like even hate math lessons. If necessary there is a movement to make fundamental changes in mathematics education, especially from learning strategies and approaches. This means to reform the learning approach, the mathematics learning approach from the usual teacher-centered activities to the situations where students are the center of attention. Teachers as facilitators and mentors while students build mathematics for themselves, not just copy following examples without understanding the concept of mathematics.

Mathematics education is notoriously difficult and less liked by students. The result of preliminary observation conducted on grade V students at SD Negeri Lamsayeun Aceh Besar shows that students' mathematics achievement is still low. This can be seen from the results of daily test on each subject that shows not achieved the completeness of student learning, which is at least 85% of students get a minimum score of 6.5. Thus, it can be said that students have not mastered mathematics learning well.

Students are not able to solve problems that arise in learning mathematics. When teachers provide training to students, students generally can not complete on time. When the teacher asks the students to collect the exercise, only a few students can finish it, while the other students do not finish it and only do a few questions that it deems easy. While the difficult questions are not done. This is because students do not possess curiosity, resilience and confidence in completing the tasks assigned by the teacher. So, when faced with difficult exercises, students will not solve them.

This condition is worsened by the inappropriate learning model used by teachers. Teachers more often apply conventional learning methods that do not lead students to learn actively. At the time of the learning process, students listen more to the teacher's explanation without giving many responses. Students also do not ask questions or fuss ideas. This resulted in teachers as the only source of learning (teacher centered). Student's learning motivation is still low. Students are more silent and do not comment on any explanation submitted by the teacher.

Students in the school also assume that math is one of the less difficult to understand than any other lesson. This is because in the mathematics lesson students must be able to perform calculations and analysis correctly, in addition students are also directed to think critically and logically so that in the end students can not solve the problems contained in learning mathematics, especially related to the material wake up space. This is what makes students assume that math lessons are very difficult.

The results of observations that researchers do show that teachers in schools are difficult in developing Student Worksheets and textbooks as teaching materials, especially on learning related to the calculation of space wake. So that students are not able to do properly the task given by the teacher. During this time, the learning process only focuses on the use of the exercises contained in the school package books and textbooks used are not developed by teachers. Thus, the questions given do not lead students to think critically in solving math problems. In addition, students are also more focused to work on individual LKS. So when students find difficulties in completing a given task, then the student will stop learning and not finish it.

The conditions outlined above create an unpleasant learning situation. Therefore, the provision of attractive Student Worksheets is indispensable in the learning process, especially mathematics learning. Teachers should use appropriate strategies to improve students' problem solving skills in mathematics learning.

The purpose of mathematics learning is to develop problem solving skills and mathematical dispositions. The ability to solve mathematical problems is dependent on the existence of problems in mathematics. Therefore there is a need for a discussion of mathematical problems. A problem is a situation in which the student obtains a goal, and must find a meaning to achieve it (Prabawanto, 2009: 39). In general the problem is the inability of a person to overcome the problems it faces. Most mathematic education experts claim that problems are questions that must be answered and responded to. They also stated that not all automated questions would be a problem. A question will be a problem only if the question indicates a challenge that can not be solved with a routine procedure the principal already knows. Fatra (2016: 1) states that problem-solving ability is a form of high-level thinking process that must be mastered by learners. To achieve this capability of course required the ability of prerequisites one of them is the understanding of mathematical concepts.

Katz in Mahmudi (2010: 5) defines disposition as a tendency to behave consciously, regularly (voluntarily) and voluntarily to achieve certain goals. These behaviors include confidence, persistence, curiosity, and flexible thinking. In the mathematical context, Katz says, mathematical disposition relates to how students solve mathematical problems; Whether confident, diligent, interested, and flexible thinking to explore alternative solutions. In the context of learning, mathematical dispositions relate to how students ask questions, answer questions, communicate mathematical ideas, work in groups, and solve problems.

At the time of the learning process of mathematics, students will more easily understand the material taught when associated with the real life of students or daily life, so that students can understand the purpose of the material described by the teacher. Therefore, the approach used in learning mathematics must be able to connect between material and real life so that the material is no longer abstract. Realistic Mathematics Approach is one approach that can be applied by teachers in teaching mathematics to students. One way that can be done by teachers to develop students' skills is to develop teaching materials in the form of LKS. According to Sa'ud (2008: 214) teaching materials are learning materials that are directly used for learning. In the Complete Dictionary of Indonesian Language, the material is defined as everything that is used for a particular purpose, whereas the teaching means the instruction given to someone to obey (know something), so the teaching material is everything that is used with the purpose of giving instructions that someone will obey ). Ichsan (2016) states that the use of Realistic Matermatic Approach (PMR) can improve students problem solving skills, so that students are able to solve the problems that arise in the learning process.

Teaching materials also mean any kind of material that digunakanuntuk help teachers / instructors in carrying out the teaching and learning activities in class definition instructional materials that include information, tools, and text that is required of teachers / instructors for planning and penelaahanimplementasi learning (Majid, 2005: 174).

Development of teaching materials is one strategy that can be done by teachers in teaching mathematics. Teaching materials or learning materials outline consists of knowledge, skills, and attitudes that must be learned by students in order to achieve a predetermined standard of competence. In detail, the types of learning materials consist of knowledge (facts, concepts, principles, procedures), skills, and attitudes or values. Teaching materials is one component of the learning system that plays an important role in helping students achieve the Competencey Standards and Basic Competencies or learning objectives that have been determined. By applying the teaching materials that have been developed, it is expected to obtain an alternative for teachers in conveying a learning material so that the learning process will run more optimally and varied and ultimately the learning outcomes and activities of students are also expected to increase.

The teaching materials that will be developed in this research are oriented with realistic mathematical approach and can be adapted to the condition of the students. Because the teaching material is designed in a contextual form so that it can improve problem solving skills and mathematical disposition in students. The development of this resource refers to the research development model suggested by Thiagarajan, Semmel and Semmel (Trianto 2013: 93) is a 4D model consisting of 4 stages, namely (1) Define, (2) Design, (3) Develop and (4) ) Desseminate.

Textbooks and Student Worksheets (LKS) are expected to change the learning process that initially focuses on teachers (teacher centered) to be student-centered (students'centered). According Prastowo (2012: 204) Student Worksheet (LKS) is a printed material in the form of sheets of paper containing materials, summaries and instructions on the implementation of learning tasks that must be done by students who refer to the basic competencies to be achieved. While Farid in Susanti (2013: 28) states the purpose of making LKS is to help teachers in delivering information that is difficult to be submitted orally so that information is submitted through LKS. The information contains the knowledge, attitudes, and skills students must have after learning. Rathati (2011: 65) textbook is a learning tool that can be used in schools and in college to support a program of modern teaching and understanding Commonly understood.

Textbooks and LKS is one of the best learning alternatives for students because textbooks and LKS can help students to add information about the concepts learned through systematic learning activities. Utilization of LKS is very practical and in it there are some exercise questions. This can familiarize the students to often train their brains to think related to the subject matter taught previously. Textbook is one container for teachers to convey information with clear. So, students can learn the subject matter although not yet get a detailed explanation of the teacher. Similarly, the LKS which is a teaching material developed by the teacher must be valid. It is strived that the exercises contained in the LKS have been in accordance with the material being taught. LKS should also be practical and effective in improving problem solving skills and mathematical dispositions. So easy to use and can be completed by students.

The results of research conducted by other researchers also showed that the development of teaching materials can improve students' ability in learning mathematics. Rosati (2011) concluded that the development of teaching materials by using teaching materials referring to the student worksheet and test questions is known that the average score of students has reached 71.51 in the category has good learning outcomes. Simanjuntak (2013) also developed mathematics teaching materials to develop students' math skills, particularly critical thinking skills. The results showed that the teaching materials developed able to improve students' critical thinking skills in math lessons.

## 2. Theoretical Framework

## 2.1. Teaching materials

Teaching materials are a set of learning tools needed to support the learning process. Teaching materials are a set of tools or learning tools that contain learning materials, methods, limitations, and how to evaluate systematically designed and interesting in order to achieve the expected goals, namely to achieve competence or subcompetence with all the complexity (Widodo and Jasmadi in Lestari, 2013: 1). This understanding explains that a teaching material must be designed and written with intruksional rules because it will be used by teachers

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to help and support the learning process.

Materials or learning materials are basically the content of the curriculum, ie subjects or subject areas with topics / subtopics and details (Ruhimat, 2011: 152). According to the National Center for Vocational Education Research / National Center for Competency Training (Majid, 2007: 173-174), there are two meanings of teaching materials: a) Teaching materials are information, tools and texts required by teachers or instructors for planning and defeating Implementation of learning. B). Teaching materials are all forms of materials used to assist teachers or instructors in carrying out teaching and learning activities in the classroom. The material in question can be either written materials or unwritten materials.

Understanding the above teaching materials, can be concluded as a material or subject matter used by teachers and students in the learning systematically organized which has the purpose of learning planning. Teaching materials are prepared by teachers to support the process of delivering the subject matter well and planned. Thus, the learning objectives achieved at the end of learning.

#### 2.2. Problem solving skill

The ability to solve mathematical problems is dependent on the existence of problems in mathematics. Therefore there is a need for a discussion of mathematical problems. A problem is the situation in which the student obtains a goal, and must find a meaning to achieve it (Prabawanto, 2009: 95). In general the problem is the inability of a person to overcome the problems it faces.

According to Izzati (in Husain, 2012: 11) a problem usually contains a condition that encourages someone to quickly solve it but does not know directly how to solve it. Still according to Izzati that if a problem is given to a child and the child can solve with a certain algorithmic procedure, then the problem can not be said as a problem. Izzati further argues that a problem can be interpreted as a situation in which a person is asked to solve a new problem for the person, and not yet understand how to solve it.

While Sujono in Ruseffendi (1991: 165), describes the problem of mathematics as a challenge when the solution requires original creativity, understanding and thought or imagination. Based on Sujono's explanation then something that is a problem for someone, may not be a problem for others or is a routine thing is not immediately achievable. Therefore problem-solving is a high level of intellectual activity.

Most mathematic education experts claim that problems are questions that must be answered and responded to. They also stated that not all automated questions would be a problem. A question will be a problem only if the question indicates a challenge that can not be solved with a routine procedure the principal already knows. According to Polya (Andriatna, 2012: 20) problems in mathematics there are two kinds, namely as follows. (1) problems to discover, can be theoretical or practical, abstract or concrete, including puzzles. Students try to find the problem variables and construct all types of objects that can solve the problem. (2) the problem to prove, that is to indicate a statement is true or false.

#### 2.3. Mathematical Disposition

There is a strong relationship between mathematical disposition and learning. Mathematics learning in addition to improving the ability of mathematical thinking or cognitive aspects of students, must also consider the affective aspects of students, namely mathematical disposition. Mathematics learning in the classroom should be specially designed so that in addition to improving student learning achievement can also improve mathematical disposition.

Katz (Mahmudi, 2010: 5) defines disposition as a tendency to behave consciously, regularly (voluntarily), and voluntarily to achieve certain goals. These behaviors include confidence, persistence, curiosity, and flexible thinking. In the mathematical context, Katz says, mathematical disposition relates to how students solve mathematical problems; Whether confident, diligent, interested, and flexible thinking to explore alternative solutions. In the context of learning, mathematical dispositions relate to how students ask questions, answer questions, communicate mathematical ideas, work in groups, and solve problems.

A mathematical disposition is said to be good if the student likes a problem problem that is a challenge and involves him / her directly in finding / resolving the problem. In addition students feel themselves experiencing the learning process while completing the challenge. In the process students feel the emergence of confidence, hope and awareness to see again the results of his thinking.

In 1998 Polking (Sumarno, 2010: 7), suggested that mathematical dispositions show:

1) Confidence in using math, solving problems, reasoning and communicating ideas;

2) Flexibility in investigating mathematical ideas and seeking alternative methods of problem solving;

3) Diligently doing the mathematical task;

4) Interest, curiosity, and your day in performing mathematical tasks;

5) tend to monitor, reflect their own performances and reasoning;

6) Assessing mathematical applications to other situations in math and daily experience;

7) Appreciation of the role of mathematics in culture and values, mathematics as a tool, and as a language

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## 2.4. Realistic Mathematical Approach

Since 1971, the Freudenthal Institute has developed a theoretical approach to mathematics learning, known as RME (Realistic Mathematics Education). RME combines views on what mathematics is, how students learn mathematics, and how math should be taught. Freudenthal believes that students should not be viewed as passive receivers of ready-made mathematics. He said education should lead students to the use of situations and opportunities to reinvent mathematics in their own way.

The five characteristics of realistic mathematics learning are as follows (De Lange, 1987: 75)

1. Using contextual problems (the use of context)

Learning begins with the use of constexual problems, not starting from the formal system. Contextual issues raised as initial topics of learning should be a simple matter recognized by students.

2. Using models (use models, bridging by vertical instruments)

The use of vertical instruments such as models, schemes, diagrams, symbols and so on to be a bridge between one level of understanding to another level of understanding or a bridge from concrete knowledge and mathematics to formal level mathematics. The model can not be separated from the process of mathematization (ie, horizontal mathematization and vertical mathematization) because the model is the stage of the informal level transition process toward the formal math level. While working on contextual problems, students are expected to develop their own models and in general there are two kinds of models in the realistic mathematical approach of model of and model for.

3. Using student contribution (students constribution)

The great contribution in teaching and learning is expected to come from the construction and production of the students themselves, leading them from their informal methods towards a more formal one.

4. Interactivity (interactivity)

There is an ongoing interaction between one student and another, also between the student and the supervisor, the construction process undertaken by each, and the outcomes of the construction process, so that each student gets the positive benefits of the interaction. Students are free to ask questions, express consent or rejection of their friends opinion, and draw conclusions.

5. There is a connection between the various parts of the learning material (intertwining)

Mathematical structures and concepts are interrelated, therefore the interrelationships between the topics (unit lessons) should be explored to support a more meaningful teaching-learning process.

## 3. Research Methods

## 3.1. Approach and Type of Research

This type of research is development research using Thiagarajan development model, et al is 4-D model (define, design, develop, desseminate). The teaching materials that will be developed in this research are teaching materials with Realistic Mathematics Approach (PMR). The teaching materials developed are the Student Activity Sheet. In addition, researchers will also develop research instruments consisting of problem solving skills, mathematical disposition scales, student response questionnaires, and teaching materials validation sheets.

## **3.2.** Location and Time of Study

This research was conducted at SD Negeri Lamsayeun Aceh Besar in the even semester of academic year 2016/2017 on the material wake up the volume space of cube and beam. The reason researchers chose this school, because similar research has never been implemented in the school.

## 3.3. Research subject

Subjects in this study were all students of grade V at SD Negeri Lamsayeun Aceh Besar.

## **3.4. Research procedure**

The development model in this study is schematically illustrated in Figure 3.1 below:





#### 3.5. Research result

Based on the results of data analysis that has been previously described that the teaching materials that are developed based on realistic approach is stated practically. This means that successful teaching materials are developed easily and can be implemented by teachers and students. As for some things that support the practicality of these teaching materials:

1) Textbooks are easy to understand and easy to use by teachers in the learning process, realistic approaches are clear, and easy to implement by teachers in realistic implementation is clear, and easily implemented by teachers in the implementation of the learning process,

2) LKS prepared easily understood by students because the instructions given clear, easy to read text, drawings or tables that are used easy to understand that will facilitate students in using it,

3) textbook compiled with easy-to-understand sentences, material organized systematically.

This means successful teaching materials developed easily and can be implemented by teachers and students. Thus, it can be concluded that mathematical teaching materials based on realistic approaches are stated practically. In determining effectiveness seen from some aspect that is: (1) mastery learning classically, (2) ability of teacher to manage learning, (3) activity of student during learning, and (4) questionnaire of student response. The following will be presented a discussion for each indicator in measuring or looking at the effectiveness of teaching materials based on realistic approach.

3.5.1. Students' Complete Learning Classically

Based on the results of the analysis on first and second field trials obtained that the problem solving ability and mathematical disposition of students have met the criteria in classical. This is because, the material and the problems that exist in textbooks and LKS are developed in accordance with the conditions of student learning environment and refer to realistic problems. With the application of teaching materials based on realistic approach, students will be actively involved in the learning process. Students are able to construct their own knowledge and draw conclusions from the knowledge found with the guidance and instruction of the teacher or friend in the direction of the questions that lead.

In line Vygotsky's view (Trianto, 2011: 39), namely the provision of assistance by teachers in the early stages of learning and reduce scaffolding as long as they complete their task. The more active the students handle the learning tasks, the more effective the learning is done and the impact on students' learning completeness in a classical way. It is also reinforced by Sutawidjaja (2004) that, according to constructivism, every knowledge including mathematics can not be transferred from one individual to another, leaving the individual himself who must construct his own knowledge in his mind.

This is supported by the results of Subanindro (2012) which is a lesson developed effectively in terms of students' learning mastery. This means that the teaching materials developed have met the effective criteria. So it can be concluded that the students' learning completeness in class showed the use of developed instructional materials meet the criteria of effectiveness.

3.5.2. Master's Ability to Manage Learning

The next effective indicator is the ability of teachers to manage learning. From the research result, it is found that the ability of the teacher to manage the learning is in good category. Thus it can be concluded that the ability of teachers to manage learning has met the criteria of effectiveness.

The above description provides an overview of the teacher's ability to manage learning in the classroom. This is because teachers are able to motivate students and communicate learning objectives, connecting lessons at the time with previous lessons, presenting constexual issues so that students together with their groups solve these constexual problems, so that teachers can direct students to find the model of the constextual problem. After that, students can compare and discuss answers with other groups so that teachers can draw conclusions from these constextual issues.

In the learning process, the ability of teachers in the management of time is also very necessary. This is because, teachers can manage the time as well as possible and as effectively as possible. As Slavin (2006: 227) puts it, one of the criteria for the effectiveness of learning is "The degree to which the students are given enough time to learn the beig taught material" means the time given to the students to study the material presented.

The results of this study are in line with research conducted by Frisniory (2013) which shows that the ability of teachers to manage learning shows the use of developed materials meet the criteria of effectiveness. 3.5.3. Student Activity During Learning

Based on data analysis on student activity on first and second field trial, it is found that the six categories of student activity have met the ideal set ideal time criteria. So it can be concluded that the activity of students by using teaching materials developed has met the criteria effective.

The above enlightenment illustrates that students have high spirits in the learning process. This is because students do more things related to learning compared with things that are not relevant to learning. This is similar to Treffers in Wijaya (2012: 21) which states that in learning, students are expected on the issue of konstektual or realistik.

Departure from this realistic problem, students can find the concept of math. Furthermore, students make use of their own models. The form of the model in question must be adapted to the model of the realistic situation and the mathematical model developed by the students themselves. It is as stated by Fatra (2016) that the realistic learner should really be able to direct the students to understand the meaning of the learning contextually. , Students are asked to produce something more concrete. Then the next interaction between students with students and students with teachers in the learning process. The integration of materials in mathematics is essential so that it is not uncommon to learn certain topics in mathematics always related to mathematics material that has been or will be given.

This is reinforced by the results of research Sinaga (2007) that the level of student activity has met the ideal time tolerance limit based on effective criteria. Besides it can be concluded that student activity during learning by using realistic approach has fulfilled the criteria of effectiveness. In line with that, Hainan (2012) also states that the effectiveness of student learning time can be achieved well through a learning approach that is in accordance with the subject matter taught by the teacher.

#### 3.5.3.1. Student Response

Based on the analysis of student response data on the first and second field trials given at the end of the lesson, the overall student feels helpful and happy with the mathematical materials based on the realistic approach developed. In other words, the response given after the students are given learning using this resource is very positive. Based on the students' response to the first and second field experiments on the component of the teaching materials has met the criteria of effectiveness.

#### **3.6.** Conclusion

Based on the results of analysis and discussion in this study, put forward some conclusions as follows:

1. Teaching materials developed through realistic mathematical approaches have been validated, practicable and effective to improve problem-solving skills in grade V students in SD Negeri Lamsayeun Aceh Besar and have achieved good category.

2. Teaching materials developed through realistic mathematical approaches have been declared valid, practical and effective to improve the ability of mathematical disposition in grade V students in SD Negeri Lamsayeun Aceh Besar and has achieved a good category.

3. The effectiveness of teaching materials based on realistic approach in improving problem solving ability and mathematical disposition has been effectively used in mathematics learning, which include:

A) 85% of students who take the problem solving test score a minimum of 75.

B) Achieving the ideal percentage of student activity time.

- C) Achievement of teachers' ability in managing learning has been good.
- D) At least 80% of the number of subjects studied provide a positive response to the composition of learning devices based on a realistic approach developed.
- 4. Problem solving abilities and mathematical dispositions in students taught material of beam volumes and cubes using instructional materials through realistic mathematical approaches have increased. Improvements that occur on the "moderate" criteria. Student responses to the components of the learning component and the learning activity are positive.

# 3.7. Suggestion

Based on the results of the above research, it can be suggested several things as follows:

1. Teachers can use teaching materials based on realistic approaches as an alternative to learning in the classroom as they have been effective and can improve problem solving skills and mathematical dispositions with the highest aspect of solving problems.

2. Teaching materials based on realistic approach need to be tested to other schools so that coverage and quality of this device can be fulfilled.

3. Schools and teachers are expected to provide creative and innovative learning to be able to attract and improve students' learning motivation by developing mathematics-based teaching materials based on realistic approaches to face issues that are in line with the reality surrounding students so they can attract students to learn.

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