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Development of Learning Materials through CTL with Karo Culture Context to Improve Students' Problem Solving Ability

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ABSTRACT

The study aims to: 1) develop valid, practical, and effective quality learning materials for class VII SMP Berastagi 1 Program that focuses on the contextual teaching and learning model with the Karo cultural context (CTL-KCC); and 2) examine the enhancement of students' math problem-solving abilities as a side effect of using CTL-KCC learning materials. This research is development research using a 4-D development model consisting of four stages: define, design, develop, and disseminate. This research yielded learning materials such as learning implementation plans, student books, student worksheets, and mathematical problem-solving ability tests.The following conclusions were uncovered as a result of the research:1) In regards to their respective criteria, CTL-KCC learning materials had also met the valid, practical, and effective criteria.2) The N-gain value during the first trial of 0.30 for the "medium" criteria enhanced to 0.47 for the "moderate" criteria in the second trial, indicating an improvement in students' ability to solve mathematical problems using CTL-KCC learning materials.

A. INTRODUCTION

Education, in accordance with Trianto (2013:1), is a dynamic and ever-evolving form of human culture. In order for education to foster future growth, students' skills must be developed through education to prepare them for addressing and resolving challenges in the future. Math plays a crucial role in education, particularly in assisting with the skill-building of students. A student's ability to think clearly and systematically can be improved by studying mathematics. Cornelius (in Abdurrahman, 2012: 204) also stated that mathematics needs to be studied, among other things, because mathematics is (1) an alternative to thinking logically and clearly, (2) an alternative to solving problems in everyday life, (3) an alternative to recognizing various patterns of relationships and generalizing experiences, (4) an alternative for developing creativity, and (5) an alternative for increasing awareness of cultural development. This statement shows the need to learn mathematics to shape the potential of students' thinking, communicating, solving problems, reasoning, and connecting mathematical content with actual conditions so that they can solve problems in everyday life.

According to NCTM (in Juliani and Surya, 2021:42), "Problem solving should be the main focus of the mathematics curriculum." According to Dahar (2011: 121), the ability to solve problems is the primary goal of education. According to Minarni et al. (2020:48), Mathematics places a premium on problem solving. If mathematics is regarded as a product, then problem solving is central to it. Various concepts, principles, and procedures are sought and discovered in the hope that they can be used to solve problems. In Manurung, Siagian, and Minarni's (2020:109) research, it was revealed that students' ability to solve mathematical problems is the ability of students to solve non-routine mathematical problems in terms of (a) understanding the problem, (b) creating a problem-solving plan, (c) carrying out the plan, and (d) checking answers again. But the facts on the ground show that students' ability to solve problems is still relatively low. This can be seen in the results of research conducted by researchers and in initial observations at Berastagi 1 Public Middle School. Educators stated that the majority of students did not remember the basic concepts of the material. When questions are presented in the form of a story or in the form of material containing geometric figures (flat shapes and geometric shapes), students are not yet able to solve them and ask the teacher about the correct formula for the problem. These conditions show that the concept is not mastered by students. The mistakes of the majority of students related to the process of solving problems because students were not familiar with the

problems given, so they did not understand the process. As a result, it is possible to conclude that students' problem-solving abilities are lacking.

Students' low problem-solving skills are caused by the teacher's use of an inappropriate learning model. Based on the observations of researchers, it is known that students are still less active in learning, and teachers are still presenting material using conventional methods. Students also have not been able to work on non-routine questions presented by the teacher. Besides that, from the results of interviews with mathematics educators, it was concluded that students still experience difficulties learning mathematics. Thus, in order to maximize students' potential for problem solving, the teacher's teaching system must be maximized. In research, Surya E., Feria and Mukhtar (2017: 87) Describe the various factors that contribute to students' inability to solve maths problems. Students are often embarrassed to remain in front of their class. Students also think mathematics is a scary and boring subject. While educators do not give students chances to acquire the mathematical knowledge that they will need, Lack of teacher encouragement can also cause students to feel confident. It can be concluded that there is still a lack of student confidence in school, especially in mathematics. Many students still make mistakes, such as not understanding the concept and not being able to solve the problem in question. This is coherent with Sari, Syahputra, and Surya research (2021: 421), which states that students only focus on the results of their answers but do not understand the process of answering them correctly or not. Apart from that, students are not accustomed to solving non-routine contextual problems, so they find it difficult to solve these problems. As a result, it is critical to have learning materials that can increase students' active attitudes during learning as well as their process of constructing knowledge so that they can solve the problems given.

Arikunto (2010:62) argues that " in a bid to enhance math education quality, studies, design, and innovation research, such as the development of learning materials," are required. Learning devices are equipment that are used in the school setting to tote out learning activities. The learning materials include student guidebooks, learning materials, evaluation instruments or learning achievement tests, worksheets, and lesson plans. There is a need for learning materials in learning activities, and educators are required to develop them. Research by Apulina, Saragih, and Siagian (2019:17) states, "When compared to students who had been taught with instructional materials, learners who were provided with instructional materials had absolutely superb achievement scores". The most important aspect that must be considered when trying to conduct classroom instruction is the learning materials. (Trianto,2009:201). According to Purnama, Khairani, and Surya's (2021: 53) research, the real meaning of learning material is to enable the the use of cost effective and efficient learning in order to establish a setting or surroundings that enables learners to learn. improves learners' performance, generates interest in academic achievement, provides students the opportunity to practice, and helps students solve problems.

According to Syah (Nugroho, 2017:34), educators can also influence the condition of students, including how they present material. Prastowo (2014:52) adds that the teacher is a factor that influences students' conditions, including how the teacher delivers material. As a result, efforts must be made to innovate in the course of studying mathematics in order to facilitate mathematical problem-solving abilities. Lestari (2015: 34) also stated that the learning design used can encourage students to be seen as relevant for increasing self-confidence and interaction between students and solving math problems the contextual model is an innovative educational design that can be used to help students make learning more meaningful.

The CTL scheme applies to the use of mathematics in everyday activities in order for students to better comprehend the advantages of the math concepts they are beginning to learn. Sanjaya (2014:56) CTL is an educational method that encourages students to practice the knowledge they have gained by applying it to real-world situations. Among the contextual approach's features is that it starts with students being faced with contextual problems that can challenge them to solve these problems. According to Johnson (2020: 65), "Contextual teaching and learning (CTL) is a method that encourages the brain to build structures that embody meaning. CTL is a nerve teaching method that creates meaning by connecting educational content to the lives of students. According to Trianto (2009: 119), students who use contextual learning to learn mathematics must feel that mathematics is meaningful and can be applied in everyday life. Learning context problems uses a variety of contexts to bring up situations students have faced in real life. Students' skills in solving mathematical problems will increase as a result of this process. As a result, the CTL learning model was chosen because it has the chance to enhance its capacity for solving math problems.

According to Efendi and Syariffuddin (2021:26), combining mathematics and culture will expand Indonesian appreciation for local geniuses. According to Montago and Dawson (in Daryanto, 2015: 34), Culture is a way of life, specifically one that exudes the identity of a nation. Meanwhile, contextual learning based on student culture, according to Hosnan (2014:64), can help students feel like mathematics is a natural

part of their lives. The local cultural context's success in learning is determined by the context chosen. Students will feel more at ease with the material if they study mathematics in a cultural context. The local culture of students at Berastagi 1 Public Middle School, the Karo cultural context, was chosen for this study. In line with that, it is desirable that mathematics learning tools be developed in accordance with the Karo cultural context using a CTL-based learning model.

Based on the explanation above, it is important to conduct studies focusing on the development of learning materials. This research is entitled, "Development of Learning Materials through Contextual Teaching and Learning with Karo Culture Context (CTL-KBK) to Improve Students' Problem-Solving Ability."

B. RESEARCH METHODS

This research includes development research using the Thiagarajan 4D development model. In this study, researchers developed learning materials based on the contextual teaching and learning model with the Karo cultural context (CTL-KBK) on quadrilateral material. This research was conducted at Berastagi 1 Public Middle School. This research was conducted in classes VII-3 for trial 1, and VII-1 for trial 2, each consisting of 32 students.

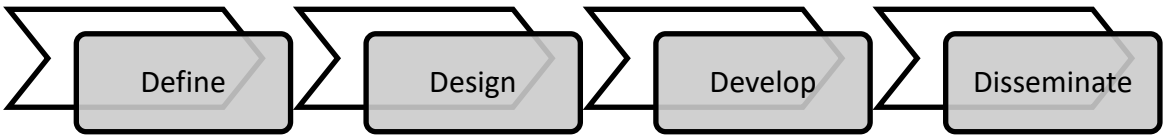

Figure 1. 4D Modeling Schematic

The developed learning materials must satisfy the requirements of being valid, practical, and effective.. Learning materials are said to meet valid indicators if the CTL-KCC learning materials developed are at least in the assessment category ($4 \leq Va \leq 5$). Learning materials are said to meet practical indicators based upon observations of learning materials execution in the classroom, including in the category of "Well implemented." ($3 \leq 0k < 4$). The developed learning materials are considered to be effective if: (1) the minimum test score for students' problem-solving abilities is 55 (category "medium") and classically at least 85% of students meet the learning mastery; (2) the average student response is in the range of $3 \leq Rs < 4$ (category "positive response");

The normalized N-Gain data, according to Hake (1999), can be used to determine the improvement in students' capacity for solving mathematical problems as follows:

$$N_{Gain} = \frac{S_{post} - S_{pre}}{S_{max} - S_{pre}}$$

Utilizing the gain index normalized criterion (g) presented in

Table 1. Normalized N-Gain Score Criteria

Gain Score	Criteria
$\mathbf{g \leq 0,3}$	Low
$\mathbf{0,3 < g \leq 0,7}$	Medium
$\mathbf{g > 0,7}$	High

C. RESULT AND DISCUSSION

1. Stage 1 (Define)

At this point, the researchers discovered several flaws in the learning materials used in SMP Negeri 1 Berastagi. For example, using the same lesson plans year after year that are not in line with the current curriculum The worksheet is ineffective. Furthermore, teachers continue to use traditional education in the learning process.

2. Stage 2 (Design)

An initial draft of a student book, a student worksheet, lesson plans for five meetings, and a math problem-solving ability test were created at this point. Draft 1 refers to all of the results of this design stage.

3. Stage 3 (Develop)

Draft 1, which had been amended in light of expert feedback, was put to the test outside of the research subject class at this point. The goal is to identify draft I's flaws so that the teaching materials can be revised and improved. Specialist validation yields content validity assessments that demonstrate that all learning materials meet the valid criteria. The following table summarizes the findings:

Table 2. Validated Instruments

No	Validated Instruments	Scor	Category
1	Lesson Plan	4,41	Valid
2	Student book	4,34	Valid
3	Student worksheet	4,29	Valid
4	Mathematic problem solving ability test	valid and Reliable	

Trial 1

If the developed teaching material meets the valid criteria, it is referred to as "draft II." The next step is to conduct learning using the CTL-KCC model with 32 students in classes VII–3. Based on an examination of the outcome measures of observational data of developed by changing in Trial 1, one can see the practicality of learning using the CTL-KCC model.The overall average score is 2.878, placing it in the "poorly implemented" category.

The next analysis is to look at the effectiveness of learning materials using the CTL-KCC model. The effectiveness of the developed teaching materials is reviewed based on two aspects, namely: 1) Completeness of classical student learning 2) Student response.

Table 3. Pre-Test and Post-Test Classical Completeness of Problem Solving Ability Tests Trial 1

Category	*Pre-test*	Classical student learning mastery	*Post-test*	Classical student learning mastery
	The Total Number Of Students		The Total Number Of Students	
Complete	5	15,625 %	21	65,625 %
Not Complete	27	84,375 %	11	34,375 %
Total	32	100 %	32	100 %
Average	33.496		53.857	

According to the classical student learning outcomes completeness criteria, at the bare least 85% of students who are enrolled the student's math problem solving skill test score ≥55. As a result, the post-test results of students' mathematical problem-solving abilities did not meet classical completeness, as they only received a percentage of 65.626%. Based on the category of student response effectiveness, a percentage result of 89% was obtained in the "positive response" category.

Based on trial I data examination, it was also discovered that developing learning materials was not meeting all of the effective guidelines, so modifications were made to begin producing learning materials that then met any of the effective considerations established. Based on the results of the weak points in the teaching materials in Trial I, revisions were made, specifically for lesson plans relating to the distribution of academic tasks and student books and worksheets relating in relation to the subject matter being covered. Following the revision, trial II is conducted to assess the efficacy of the learning materials in addition to the improved performance in math problem-solving ability.

Trial 2

The second trial was carried out in class VII-I with a total of 32 students. Based on an examination of the outcome measures of observational data of developed by changing in Trial 1, one can see the practicality of learning using the CTL-KCC model. The overall average score is 3.347, which was included in the "well implemented" category.

Furthermore, the following table shows the findings of the examination of the effectiveness of learning materials using the CTL-KCC model:

Table 4. Pre-Test and Post-Test Classical Completeness of Problem Solving Ability Tests Trial 2

Category	*Pre-test* The Total Number Of Students	Classical student learning mastery	*Post-test* The Total Number Of Students	Classical student learning mastery
Complete	10	31,25 %	28	87,5 %
Not Complete	22	68,75%	4	12,5 %
Total	32	100 %	32	100 %
Average	39,307		67,627	

According to the classical student learning outcomes completeness criteria, at the bare least 85% of students who are enrolled the student's math problem solving skill test score ≥55. As a result, the post-test results of students' mathematical problem-solving abilities meet classical completeness, as they only received a percentage of 87.5%. Based on the category of student response effectiveness, a percentage result of 92% was obtained in the "positive response" category.

Learning materials that adhere to the practical and effective criteria are then put through the N-Gain Test to see if they improve problem-solving skills. According to the findings of the analysis, there was an improvement in problem-solving abilities in trials 1 and 2. The results are shown in the table below:

Tabel 4. Improvement of problem solving ability

Trial	N-gain Score	Category
Trial 1	0,30	Medium
Trial 2	0,47	Medium

4. Stage 4 (Disseminate)

Learning materials are complete when they have received positive feedback from specialists and successful design trials. The learning materials are setelah itu, bundling dan diseminasi, and decided on a larger measure. The fourth stage, however, was not explained since the disseminating process was still not tried out in this study.

D. CONCLUSION AND SUGGESTIONS

Derived on the findings of the studys, findings, and discussion in the previous discussion, we get the following conclusions.

1. The teaching materials that have been developed through Contextual teaching and learning in the context of the Karo culture (CTL-KCC) are valid to use and able to improve the problem solving abilities of students of Berastagi 1 Middle School.
2. The teaching materials that have been developed through Contextual teaching and learning in the context of the Karo culture (CTL-KCC) are practical to use and able to improve the problem-solving abilities of students of Berastagi 1 Middle School.
3. The teaching materials that have been developed through Contextual teaching and learning in the context of Karo culture (CTL-KCC) are effectively used and are able to improve the problem-solving skills of students of Berastagi 1 Middle School.

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