Developing Learning Tools Based on a Realistic Approach Assisted by Geogebra to Improve Mathematical Connection Skills and Mathematical Creative Thinking Skills of Junior High School Students 17 Medan

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Abstract

This research is a research development of teaching tools with Geogebra-assisted based on Realistic Mathematic Education (RME) to improve Improve Mathematical Connection Skills (MCS) and Mathematical Creative Thinking Skills (MCTS) of 8th-grade students. The teaching materials were designed so that they meet the valid, practical, and effective criteria. This research was conducted at SMP Negeri 17 Medan, Indonesia. The first step of this research is to analyze the level of validity, practicality, and effectiveness of learning tools based on Geogebra's realistic approach to improving students 'mathematical connection skill and students' mathematical creative thinking skill.

The findings of this study are: (1) RME-based teaching materials have fulfilled valid, practical, and effective criteria in improving students' mathematical connection skills and students' critical mathematical thinking skills, (2) Students' mathematical connection skills using Geogebra-assisted PMR-based learning tools can be seen from N-Gain posttest I amounted to 0.21 in the low category increased to 0.37 in the medium category in posttest II, (3) The ability to think mathematically creative students using Geogebra-assisted PMR-based learning tools increased as can be seen from the N-Gain posttest I of 0, 25 in the low category increased to 0.31 in the medium category in posttest II, (4) There was a significant difference between the average mathematical connection skills and mathematical creative thinking skills of students who were given learning tools based on Geogebra-assisted realistic mathematical approaches with conventional approaches

Keywords: Realistic Mathematic Education, *Geogebra,* Mathematical Connection Skills (MCS), Mathematical Creative Thinking Skills (MCTS), mathematics teaching tools

1. Introduction

Education is the only asset to build quality human resources. Through quality education, the nation and country will be upheld in the eyes of the world. Shoimin (2014: 20) states part of the goal of national education is to build human resources that have a very important role for the success and sustainability of development. According to Hasratuddin (2018: 34) one of the educational programs that can develop the ability to think critically, systematically, logically, and creatively is mathematics. But it is unfortunate, in general the results of learning mathematics in Indonesia have not achieved satisfactory results. Aripin (2017: 226) states the reality in the field of mathematical ability is still low seen from the results of the PISA study a few years earlier, has not shown satisfactory results. The results of the last year's study of 2015 with a score of 386 in the field of mathematics competence has increased when compared to 2012 with a score of 375. However, when compared with the overall average of 490 the level of achievement is still below average. In addition, the results of the TIMSS study in 2015 revealed that Indonesian students need to strengthen their ability to integrate information, draw conclusions, and generalize their knowledge into other matters.

Rita (2016: 110) states that the ability of mathematical connections is one of the five standard skills students must have in learning mathematics. In addition, mathematical connection is also one of the five skills developed in learning mathematics in America in 1989. The five skills are as follows: communication (mathematical communication), reasoning (reasoning), connection (mathematical connection), problem solving (problem solving), and understanding (mathematical understanding).

Furthermore, in addition to mathematical connection capskills, a person is also required to be creative. Fatah (Dewi et al, 2018: 1407) stated "This is in accordance with who said that learning mathematics in schools is not only related to mastering mathematics material as much as possible, but also to achieve higher goals, such as building students' thinking skills" . That is, learning mathematics at school is not only in the mastery of the material, but also to achieve higher goals, such as building students' thinking skills. One of them is the ability to think creatively.

The ability to think creatively is needed by students in solving mathematical problems. Hidayat et al (2018: 42) by having the ability to think creatively can make humans more flexible mentally, openly and easily align with a variety

of situations and problems. However, in learning mathematics still rarely pay attention to creativity ". In addition, Munandar (Saragih, 2014: 125) said "according to the features of the ability to think creatively (aptitude), namely: (1) current thinking skills (fluency), (2) flexible thinking skills (flexibility), and (3) original thinking skills (novelty) ". That is, the ability to think creatively which consists of (1) fluency (fluency); (2) flexibility (flexibility); and (3) novelty.

One way that can be done so that the ability of mathematical connections and the ability to think creatively becomes good is the need to design a learning that can stimulate these skills well. For a teacher, the existence of learning tools is an obligation that must be owned by the teacher. According Suhermi (2017: 26), "Learning tools are learning components that must be prepared by teachers as organizers of learning so that learning can be carried out effectively, efficiently, and obtain the expected results".

Nopiyani, et al (2016: 46) suggested one approach in mathematics learning is realistic mathematics learning. This approach is known as an approach that has been successful in the Netherlands. Freudenthal as a figure who first developed a realistic mathematical approach in the Netherlands in 1973, said that "mathematics is a human activity", meaning that mathematics is human activity.

According to Susana (2014: 55) states that, a realistic mathematical approach is a learning theory developed specifically for mathematics. Mathematics is not given directly just like that but students must be able to construct their knowledge, through contextual problems.

The results of research conducted by Arsaythamby (2014: 309) show that "This study showed that Mathematics activities for those who were taught using IRME are higher than for those using the conventional approach". The description implies that learning using RME shows a better percentage of student activity than using conventional approaches. Based on this, it was found that the implementation of the RME approach was more effective than the conventional approach. In addition, Hidayat (2015: 38) states that "Therefore, the quasi-experimental study was conducted to examine the effectiveness of Realistic Mathematical Education towards the conceptual understanding of linear programming"

A learning approach will certainly be more innovative if applying media in the implementation process. This is supported by Fitriyani (2014: 270) one of the effects of technological progress in learning is the creation of software that is very helpful and facilitates the completion of mathematics. Nopiyani (2016: 47) computers have a lot of software that can be used to help the learning process, especially mathematics. One software that supports mathematics learning is Geogebra. This program allows students to make simple visualizations of geometrical concepts, making it easier for students to be able to find, express, and make mathematical representations of mathematical ideas or ideas students have. This is supported by the opinion of Hohenwarter & Fuchs (Nopiyani, 2016: 47) which states that Geogebra is very useful as: 1) media demonstration and visualization; 2) construction aids; 3) the invention process aids; and 4) communication and representation tools.

Based on the explanation above, then as an effort to overcome the problem of the low ability of connections and mathematical creative thinking that is still low, then the problem is possible to be solved by developing learning tools, so researchers feel the need to conduct research entitled " **Developing Learning Tools Based on aRealistic Approach Assisted by Geogebra to Improve Mathematical Connection Skills and Mathematical Creative Thinking Skills of Junior High School Students 17 Medan** "

2. Theoretical Framework

The theories that form the basis of this research include Mathematical Connection Skills (MCS), Mathematical Creative Thinking Skills (MCTS), Realistic Mathematic Education, *Geogebra,* and mathematics teaching tools.

2.1 Mathematical Connection Skills

According to Faiqotul (2016: 122) argues that one of the important skills students must have is the ability of mathematical connections. Namely students must be able to use mathematics in other fields of science, be able to link mathematics with other mathematical concepts and with other fields of science and mathematics with everyday life. Friska, et al (2012: 128) suggested "indicators of mathematical connection skills can be measured through the ability: (1) connections between mathematical concepts; (2) mathematical connections with other disciplines; (3) mathematical connections with everyday life ".

The connection between mathematical concepts is seen that mathematics is a structured and interrelated science between one topic with another topic and that one wife may be a prerequisite for another, or that certain concepts are needed to explain other concepts. Mathematical connection with other disciplines is seen that mathematics is a science that cannot be separated from other sciences. Many other sciences whose discovery and development depend on mathematics. Among others, physics, chemistry, biology, engineering, agriculture, social, economics, psychology, philosophy, and others. Mathematical connection with daily life is seen that mathematics is a logical approach and can be applied in various fields.

2.2 Mathematical Creative Thinking Skills

Johnson (Siswono, 2004: 2) says that creative thinking implies perseverance, personal discipline and attention involving mental activities such as asking questions, considering new information and unusual ideas with an open mind, making connections, especially between something similar, associating one another freely, applying imagination to every situation that generates new and different ideas, and paying attention to intuition.

The same thing was expressed by Mc Gregor (Minarni, 2018: 101) that creative thinking is thinking that leads to the acquisition of new insights, new approaches, new perspectives, or new ways to understand something. In addition, Pehkonen (Aziz, 2012: 40) states that "creative thinking is a combination of logical thinking and divergent thinking based on intuition in consciousness. Specifically it can be said of creative thinking as a whole or a combination of logical thinking and divergent thinking in order to produce something new ". Based on some of these opinions creative thinking can be said as a thought process of someone who brings in or brings up a new idea, so as to produce or create something new.

Haylock (Mann, 2005) has applied the concepts of fluency, flexibility, and authenticity to the concept of creativity in mathematics. Students' creative thinking skills can be seen from their work or solutions to problem solving given by students as a representation of their creative thinking processes. Each student will have different skills in terms of the creative thinking process.

2.3 Realistic Mathematics Education (RME)

The realistic mathematics approach is an approach to learning mathematics developed since 1971 by a group of mathematicians from the Freudenthal Institute, Utrecht University in the Netherlands. This approach is based on the assumption of Hans Freudenthal (1905-1990) that mathematics is a human activity. According to this approach, the mathematics class is not a place to move mathematics from the teacher to students, but rather a place for students to rediscover mathematical ideas and concepts through exploration of real problems. The same thing was stated by Gravemeijer (2002) which states that Realistic mathematics education is rooted in Freudenthal's interpretation of mathematics as an activity. Freudenthal takes his starting point in the activity of mathematicians, wheather pure or applied mathematicians. He characterizes mathematical activity as an activity of solving problems, looking for problems and organizing a subject matter - wheather mathematical matter or data from reality. The main activity, according to Freudenthal, is organizing or mathematizing.

Through these contextual problems, students are trained to solve problems in their own way. Treffers (1987: 51) defines that Mathematical is an organizing activity. It refers to the essence of the mathematical activity, to the thread that runs through all mathematics education directed towards the aisition of factual knowledge, the learning of concepts, the attainment of skills and the use of language and other organizing skills in slving and the use of language and other organizing skills in solving problems that are, or are not placed in a mathematical context.

Then according to Gravemaijer (Hasratuddin, 2011) states there are three key principles in Realistic Mathematics Education, namely:

a. Guided reinvention/ Progressive Mathematizing (Guided Discovery / Mathematizing Progresive)
b. Didactical Phenomenology
c. Self-Develoved Models

2.4 Geogebra

he name Geogebra is short for geometry (algebra) and algebra (algebra), but this program not only supports these two topics, but also supports many mathematical topics beyond both. Munir (Japa, 2017: 121) states that the Geogebra media system is a form of learning that utilizes technology and is not limited by space and time. Syahbana (2016: 34) Geogebra is a very effective tool for learning mathematics in schools. Geogebra can be used as a medium of mathematics learning to demonstrate or visualize mathematical concepts as well as tools to construct mathematical concepts.

2.5 Development of Teaching tools

According to Syahrir (2016: 437) learning tools are all things that can allow teachers and students to carry out the learning process according to the curriculum. In line with this opinion, Trianto (2011: 201) states "learning tools are tools used in the learning process". Some learning tools needed are RPP, Syllabus, LAS, books and evaluation tools. Furthermore, it can be said that the learning device using a realistic approach is a learning device which includes learning steps using a realistic approach, where the initial problem presented is in the form of a contextual problem. In implementing the learning device consists of various components depending on the needs of each person (teacher).

3. Research Methods

The research methods consist of research design, subject of the research, data collection techniques, validity and reliability of the data, and data analysis.

3.1 Research Design

This type of research is Research and Development (Reseach and Development), using the Thiagarajan learning tools development model, and Semmel (1974), namely the 4-D model (define, design, develop, and disseminate). The learning tools developed with the Geogebra-assisted Realistic Approach in this study include the Lesson Plan (LP), Teacher's Book (TB), Student's Book (SB), Student Worksheet (SW). The researcher also developed a research instrument consisting of tests of connection skills and students' creative thinking.

3.2 Subject of The Research

The subjects in this study were students of class VIII-1 and VIII-2 of SMP Negeri 17 Medan in the academic year 2019/2020.

3.3 Data Collection Technique

Learning tools are assessed based on the criteria Nieveen (1999) put forward criteria in assessing the quality of learning based on three aspects, namely: validity, practicality and effectiveness (effectivenes). To measure the validity, practicality and effectiveness of mathematical learning tools, then developed and developed research instruments.

3.4 Validity and Reliability

Validity is a characteristic that must be possessed by the mathematical connection skills test and the mathematical creative thinking skills test, as well as the completeness of teaching materials, namely the Learning Implementation Plan (RPP), Student Activity Sheet (LAS), Student Book (BS), and Teacher's Manual (BG) . This validation sheet contains the assessed components including: format, language, illustrations, and content. The reliability of the research instrument was obtained through the Cronbach alpha test.

3.5 Data Analysis

The data analysis technique used in this research is descriptive analysis. The data obtained were analyzed and directed to answer the question whether the learning tools with the developed RME model met valid, effective, and practical criteria for developing connections and creative thinking skills of junior high school students. Data on increasing mathematical critical thinking skills is determined based on the normalized gain index from Hake (1999).

4. Result and Discussion

4.1 Result

a. Mathematical Connection Skills

Data posttest of students' mathematical connection skills presented in Table 2 below.

Table 1. Data Improvement of Students' Mathematical Connection Skills

	Tes I	Tes II	Difference
The Highest score	86,11	94,44	8,88
Average	72,22	80,03	7,81
The Lowest Value	44,44	52.08	7,64

From Table 1, it shows that the average mathematical connection skills of students in the posttest I results is 72.22. And the average mathematical connection skills of students on the posttest II results is 80.03. This shows that the average increase in students' mathematical connection skills from experiment I to experiment II was 7.81.

Improvement of students' mathematical connection skills in the first trial will be seen through the N-Gain from the results of the pretest and posttest mathematical connection skills in the first trial. And improvement of students' mathematical connection skills in the second try will be seen through the N-Gain from the results of the pretest and posttest mathematical connection skills in the second try. The results of the N-Gain calculation on the mathematical connection skills can be seen in the following table:

Tabel. 2 Summary of N-Gain Results for Mathematical Connection Skills

N-Gain	**Experiment I**		**Experiment II**	
	Interpretation	**Total students**	**Interpretation**	**Total students**
$g \leq 0,3$	Low	24	Low	13
$0,3 < g \leq 0,7$	Medium	6	Medium	17
$g > 0,7$	Height	2	Height	2

Based on table 4.30 above, it can be seen that students who received an N-Gain score in experiment in the range> 0.7 or experienced an increase in the ability of mathematical connections in the "High" category by 2 people, students who experienced an increase in mathematical connection skills in the " Medium ”or get an N-Gain score of 0.3 <g ≤ 0.7 as many as 6 people and students who have increased mathematical connection skills with the category of" Low "or get an N-Gain score of g 3 0.3 as many as 24 people. So, the average gain in experiment I was obtained 0.21 in the low category.

And for the experiment II, it can be seen that there were 3 students who received N-Gain scores in the range> 0.7 or experienced an increase in mathematical connection skills in the "High" category. Students who experienced an increase in mathematical connection skills in the "Medium" category or got an N-Gain score of 0.3 <g ≤ 0.7 were 16 people and students who experienced an increase in mathematical connection skills in the "Low" category or got an N-Gain score ≤ 0,3 as many as 13 people. So, the average gain in experiment II was obtained 0.37 in the medium category.

b. Mathematical Creative Thinking Skills

Data posttest of students' mathematical creative thinking skills presented in Table 2 below.

Table 3. Data Improvement of Students' Mathematical Connection Skills

	Tes I	**Tes II**	**Difference**
The Highest score	86,11	94,44	8,33
Average	73,09	81,34	8,25
The Lowest Value	52,78	63,89	11,11

From Table 3, it shows that the average mathematical creative thinking skills of students in the posttest I results is 72.22. And the average mathematical creative thinking skills of students on the posttest II results is 80.03. This shows that the average increase of students' mathematical critical creative thinking skills from experiment I to experiment II was 7.81.

The improvement of students' mathematical creative thinking skills in the first try will be seen through the N-Gain from the results of the pretest and posttest mathematical creative thinking skills in the first try. And the improvement of students' mathematical creative thinking skills in the second try will be seen through the N-Gain from the results of the pretest and posttest mathematical creative thinking skills in the second try. The results of the N-Gain calculation on the mathematical creative thinking skills can be seen in the following table:

Tabel. 4 Summary of N-Gain Results in Mathematical Creative Thinking Skills

N-Gain	**Experiment I**		**Experiment II**	
	Interpretation	**Total students**	**Interpretation**	**Total students**
$g \leq 0,3$	Low	18	Low	15
$0,3 < g \leq 0,7$	Medium	14	Medium	14
$g > 0,7$	Height	0	Height	3

Based on table 4. above, it can be seen that students who get an N-Gain score in try I in the range> 0.7 or have increased mathematical creative thinking skills of students with the category of "High" by 0 people, students who have increased creative thinking skills mathematical students in the category of "Medium" or get an N-Gain score of 0.3 <g ≤ 0.7 as many as 14 people and students who have increased mathematical creative thinking skills with the category of

"Low" or get an N-Gain score of g ≤ 0.3 as many as 18 people. So, the average gain in trial I was obtained 0.25 in the low category.

And for the second trial, it can be seen that there were 3 students who received N-Gain scores in the range> 0.7 or experienced an increase in mathematical creative thinking skills with the "High" category. Students who experienced an increase in mathematical creative thinking skills with the category "Medium" or received an N-Gain score of 0.3 <g ≤ 0.7 were 14 people and students who experienced an increase in mathematical creative thinking skills in the "Low" category or got an N- score Gain g 3 0,3 as many as 15 people. So, the average gain in trial II was obtained 0.37 in the medium category.

4.2. Discussion

a. Improving Students' Mathematical Connection Skills by Using Development of Learning Tools with Geogebra-Aided Realistic Approaches

Based on the results of the posttest analysis of students 'mathematical connection skills in experiment I and experiment II showed that students' mathematical connection skills increased. The increase in students' mathematical connection skills is seen from the average results of the posttest mathematical connection skills obtained by students in experiment I by 68.75%, increasing to 87.50% in experiment II. Thus, an increase in students' mathematical connection skills by 18.75%. This shows that the use of learning tools with a Geogebra-assisted realistic approach developed has an impact on improving students' mathematical connection skills.

Improvement of students' mathematical connection skills due to the learning process using learning tools with a Geogebra-assisted realistic approach begins with contextual problems, so students can use their previous experience in understanding and solving mathematical problems. Contextual problems are designed so that the learning process is more meaningful, so that it can be understood that the contextual problem given can be used as a starting point in developing students' mathematical connection skills. Furthermore the discussion conducted by students is a bridge of mutual help between students in understanding contextual problems. This is in line with Ausubel's theory (Trianto, 2011), meaningful learning is a process of relating new information to relevant concepts contained in a person's cognitive structure. In meaningful learning the learning process starts from contextual problems and the information construction process occurs. In other words, a knowledge will be meaningful to students if the learning process involves realistic problems or is carried out in and with a context.

Regarding realistic approaches and students' mathematical connection skills research conducted by Rais and Zainal (2017) shows that "The Realistic of Mathematic Educational Approach (RME) towards the Skills of the Mathematics Connection. This means that students have a positive response and participate in the learning process. Furtthermore, based on the observation of student activity in the learning process by using the realistic mathematical educational approach is very positive and they become more active than before. The description implies that the skills of students' mathematical connections increases by using learning based on realistic approaches students are more enthusiastic by using learning approaches based on realistic approaches. In addition, through the results of student observations of the learning process used with a realistic approach is very positive and active than before. Furthermore, research conducted by Arsaythamby (2015) states that "Most of the students exposed to the RME approach had achieved better in mathematical analogy reasoning and generalization than students who went through the conventional approach. The RME approach has also affected students' perception towards learning of Mathematics. The description above implies that most students who are exposed to the RME approach have achieved better results than those students who have taken the conventional approach. The RME approach also influences students' perceptions of mathematics learning.

Based on the results of research and support of previous research above shows that learning with a realistic approach is significantly better in improving students' mathematical connection skills. So it can be concluded that learning tools based on realistic approach assisted by Geogebra have a positive impact on improving mathematical connection skills.

b. Improving Students' Creative Thinking Skills Using Development of Learning Tools with Geogebra-Aided Realistic Approaches

Based on the results of the posttest analysis of students 'creative thinking skills in experiment I and experiment II showed that students' creative thinking skills improved. The increase in students 'creative thinking skills was seen from the average posttest results of students' creative thinking skills obtained by students in experiment I of 68.75%,

increasing to 87.50% in experiment II. Thus, an increase in students' creative thinking skills by 18.75%. This shows that the use of learning tools with a Geogebra-assisted realistic approach developed has an impact on increasing students' creative thinking skills.

Improving students' creative thinking skills due to the learning process using learning tools with a Geogebra-assisted realistic approach begins with contextual problems, so students can use their previous experience in understanding and solving mathematical problems. Contextual problems are designed so that the learning process is more meaningful, so that it can be understood that the contextual problem given can be used as a starting point in developing students' creative thinking skills. Furthermore the discussion conducted by students is a bridge of mutual help between students in understanding contextual problems. This is in line with Ausubel's theory (Trianto, 2011), meaningful learning is a process of relating new information to relevant concepts contained in a person's cognitive structure. In meaningful learning the learning process starts from contextual problems and the information construction process occurs. In other words, a knowledge will be meaningful to students if the learning process involves realistic problems or is carried out in and with a context.

Regarding realistic approaches and students' creative thinking skills, research conducted by Laurens, et al (2017) states that "The students who were taught with RME achieved better than the students who were involved in conventional learning". The meaning is, that students who are taught with RME achieve better than students who are involved in conventional learning. Furthermore, research conducted by Aziz (2012) states that the development of creative thinking skills in learning mathematics with the RME approach because of principle and RME caharacteristics that are applied in the study. One of its principles is the rediscovery of a mathematical concept that allows students to experience the discovery of the concept by themselves. One of characteristics is the pattern to solve mathematical problem that is also possible to develop students creative thinking skills.

Based on the results of research and support of previous research above shows that learning with a realistic approach is significantly better in improving students' mathematical creative thinking skills. So it can be concluded that the learning tools with a Geogebra-assisted realistic approach have a positive impact on improving mathematical connection skills.

c. Difference in Results of Development of Learning Tools with Geogebra and Conventional Realistic Approaches in Improving Students' Mathematical Connection Skills

The research conducted at JHS 17 Medan in addition to seeing the results of the development of learning tools based on a realistic approach assisted by Geogebra, this study will compare with conventional learning outcomes in improving the skills to connect with the same learning material, namely SPLDV. So for that it is compared in two classes that were given different treatments, namely in the experimental class and the control class. Then both classes were given posttest to find out the mathematical connection skills after being treated. Posttest consists of 3 items containing aspects and indicators of mathematical connections that begin with aspects of connections between mathematical topics, mathematical connections with other sciences, and mathematical connections with the real world.

To measure the large difference in mathematical connection skills, it can be seen in the results of the posttests in two different classes, the experimental class obtained an average of 80.035 while the control class obtained an average of 65.38. This shows that the average learning outcomes in the experimental class are higher. Furthermore, statistical analysis was performed using the Independent Sample Different Test T-Test. After testing the skills of mathematical connections at the level of 0.05 obtained a significance value of 0.00 (sig. <0.05) which means that there is a significant difference between the average mathematical connection skills of students with the development of learning tools based on realistic realistic mathematical approaches Geogebra with conventional learning, thus reject Ho and accept Ha. Thus it can be concluded that the mathematical connections of students who are given the development of learning tools based on geogebra-assisted realistic mathematical approaches are higher than the increase in mathematical connection skills of students who are given conventional learning.

d. Difference in Results of Development of Learning Tools with Geogebra and Conventional Realistic Approaches in Improving Students' Creative Thinking Skills

The research conducted at JHS 17 Medan in addition to seeing the results of the development of learning tools based on a realistic approach assisted by Geogebra, this study will compare with conventional learning outcomes in improving students' creative thinking skills with the same learning material, SPLDV. So for that it is compared in two classes that were given different treatments, namely in the experimental class and the control class. Then both classes were given posttest to find out the mathematical connection skills after being treated. Posttest consists of 3 items

containing aspects and indicators of students' creative thinking, starting with aspects of fluency, flexibility (flexibility), and novelty. To measure the difference in students' creative thinking skills, it can be seen in the results of the posttests in two different classes, the experimental class obtained an average of 81.336 while the control class obtained an average of 69.35. This shows that the average learning outcomes in the experimental class are higher.

Furthermore, statistical analysis was performed using the Independent Sample Different Test T-Test. After testing the ability of mathematical connections to the level of 0.05 obtained a significance value of 0.00 (sig. <0.05) which means that there is a significant difference between the average creative thinking skills of students with the development of learning tools based on realistic realistic mathematical approaches Geogebra with conventional learning, thus reject Ho and accept Ha. Thus it can be concluded that the creative thinking of students who are given the development of learning tools based on realistic mathematical aids that are assisted by geogebra is higher than the increase in the creative thinking skills of students who are given conventional learning.

5. Conclusion

1. The learning tools developed through the Geogebra-assisted RME approach for mathematical connection skills and mathematical creative thinking skills have met valid, practical, and effective criteria.
2. The students' mathematical connections skills using Geogebra-assisted RME approach learning tools increased, in terms of: (1) the classical completeness of posttest in experiment I by 68.75% increased to 87.50% in the second experiment; and (2) N-Gain experiment I of 0.21 in the low category increased to 0.37 in the medium category in experiment II.
3. The students' mathematical creative thinking skills using Geogebra-assisted RME approach learning tools increased, in terms of: (1) the classical completeness of the post-test in experiment I of 68.75% increased to 87.50% in the second experiment; and (2) N-Gain experiment I by 0.25 in the low category increased to 0.31 in the medium category in experiment II.
4. There is a significant difference between the average skills of connections and mathematical creative thinking of students who are given learning tools based on realistic mathematics approach assisted by Geogebra with conventional approaches.

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