Development of the Cooperative Learning Model to Improve Students' Mathematic Generalization Ability

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Abstract.
This study aims to produce cooperative learning models in improving the mathematical generalization abilities of junior high school students that are valid, practical, and effective. This research is research and development by adopting the Plomp model design which consists of five phases, namely initial investigation, design, realization/construction phase, test phase, evaluation, and revision and implementation phase. Data collection was carried out using several instruments in the form of needs analysis questionnaires, validation questionnaires, observation sheets, teacher response questionnaires, and tests of mathematical generalization ability. The data collected was then analyzed using qualitative and quantitative methods. The results of the study show that both teachers and junior high school students need to develop learning models that can improve students' mathematical generalization abilities. In addition, other findings state that the learning model developed is proven to be valid, practical, and effective for general use. Developing cooperative learning models can further improve students' mathematical generalization abilities because they are designed based on actual needs and problems. For that, a teacher must be able to design a learning model.
Keywords: mathematics; cooperative learning model; mathematical generalization ability

1. Introduction

Mathematics is taught at all levels of school from elementary to tertiary level. One of the skills that must be mastered and play an important role in learning mathematics is reasoning. The importance of reasoning for school students has been written in the Regulation of the Minister of National Education number 22 of 2006 concerning Content Standards which is the goal of mathematics subjects, namely that students can use reasoning on patterns and characteristics, perform mathematical manipulations in making generalizations, compiling evidence, or explaining ideas. and mathematical statements [1]. Depdiknas [1] states that "Mathematical material and mathematical reasoning are two things that cannot be separated, namely mathematical material is understood through reasoning and reasoning is understood and trained through learning mathematical material". Based on the objectives of learning mathematics, one of the important reasoning mastered by students is generalization. Generalization is concluding specific evidence to general conclusions.

Concluding (generalizing) is a very important stage because through this stage students will be able to take the essence of the learning process they have done. Generalization abilities are included in reasoning abilities, so this needs to be the focus of attention in learning mathematics. Reasoning or reasoning is needed by students in learning mathematics so that they can show and analyze any problems that arise, can solve problems appropriately, can assess something critically and objectively, and can express opinions and ideas coherently and logically. The ability to generalize is very important for students to master because they can see the extent to which students understand the material conveyed.

To carry out this generalization process, students are free to look for which path to take to find conclusions drawn based on the understanding of the concepts they already have. The process of finding these conclusions is not easy, because even though students are free to choose a path to find conclusions, students also must work hard to think and be creative according to students' ideas and data previously provided by the teacher. According to Anggoro [2] concluded (generalization) is a very important stage, because through this stage students will be able to take the essence of the learning process that they have done and can see the extent to which students understand the material presented. However, the fact is that students' mathematical generalization abilities are still low.

The results of the Indonesian Student Competency Assessment Survey (AKSI) in 2017 showed that in general level difficulties in mathematics at the junior high school level, there were 49,52 knowing questions, 52,59 applying questions, and 51,52 reasoning questions. Therefore, students' reasoning is 51,52, so students' mathematical reasoning is still very lacking. This problem illustrates that students' mathematical generalization abilities in learning mathematics are still low so the impact on learning outcomes is also low.

Based on the results of the pretest during the initial observation at SMP Negeri 32 Makassar to 67 students, there were still many students who were unable to conclude after identifying the patterns found, including when solving problems. Figure 1 shows a math problem related to a pattern.

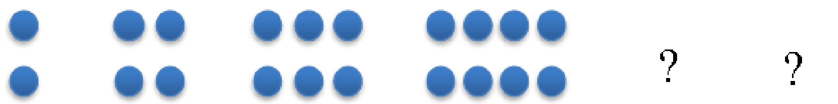


Figure 1. A series of balls arranged according to a certain pattern.

Given a row of patterned balls as shown in Figure 1, ask for the number of balls in the 7th and nth pictures. To answer the number of balls in the 7th picture all students can answer correctly, although in different ways. Most students (85%) answered by sorting the balls into pictures 5, 6, 7, thus finding the number of balls in the 7th picture, namely 14 balls. There are some students (15%) who have thought more creatively by making Table 1 as follows:

Table 1. The relationship between the number of balls and the nth image

The Picture	1	2	3	4	7
Lots of Balls	2	4	6	8	14

When asked 7 students why they made tables, all three said that if they were made in the form of a table, the calculations could be seen. 1×2, 2×2, 3×2, 4×2, 5×2, 6×2, and 7×2, so the 7th image has 14 balls. However, to answer the nth ball, all students were confused about the answer. Supposedly when they have found a pattern from the 1st to the 7th picture, students can already determine the conclusion or generalization for the nth ball image. In fact, from the results of interviews with mathematics teachers, students have studied number pattern material, but students forget the concepts that have been taught by their teachers. The results of this pretest indicate that the generalization ability of SMP Negeri 32 Makassar students is still low.

Various attempts have been made by the government to improve generalization capabilities in Indonesia but have not been satisfactory. One of the causes of low achievement in learning mathematics in Indonesia is the inaccuracy in the use of teaching methods in learning. Based on the results of interviews with the mathematics teacher at one of the Public Middle Schools in Makassar, information was also obtained that, in the learning process, most students still experience difficulties in making conjectures, manipulating mathematics, giving reasons for the correctness of solutions, and difficulties in concluding the material taught. they have obtained. This is because the learning process that is carried out is only conveying formulas and does not relate the material to experience or everyday life.

The method used still makes students bored, so students often daydream and fall asleep while participating in learning in class. Students still have difficulty receiving the material presented optimally. This is because students are less focused on following the lesson, so students become less active and learning outcomes are still unsatisfactory. When the material is delivered, students are still used to just listening and receiving information without trying to find the information themselves. Students are also still less active in asking questions or expressing opinions in class. When the teacher provides feedback or learning stimuli, students are less active in responding. When the learning process ends students still find it difficult to conclude the material that has been studied. As said by Anggoro [2] the low ability of students' mathematical generalizations is also because in their learning the teacher still uses conventional learning, and the class still focuses on the teacher as the only source of learning.

To overcome the low generalization ability of students in learning, it is necessary to make a change in the use of learning methods in schools that can encourage students' interest in learning. Especially at the elementary and junior high school levels, mathematics should be taught with learning that is related to the real world, so that the learning that occurs can make it easier for students to enjoy mathematics. Moreover, by the current curriculum, the competencies that must be mastered by students are demonstrating the skills of reasoning, processing, and presenting creatively, productively, critically, independently, collaboratively, and communicatively in concrete and abstract realms by what is learned at school and other sources available. the same from a theoretical point of view. One way to improve the learning process is to apply a cooperative learning model.

According to Rusman [3], "Cooperative learning is a form of learning using students learning and working in small groups collaboratively whose members consist of four to six people with heterogeneous group structures". In a cooperative learning system, students learn to work together with heterogeneous group members to train students to have a high social spirit. Students who are smart and able to master the material faster must be willing to share knowledge with other friends who don't understand. And students whose level of understanding is slower will be motivated to understand the material faster. A cooperative system will give students a high social sense and reduce their individualistic nature. Nur [4] argues that all cooperative learning models apply team rewards, individual responsibility, and the same opportunity to succeed, only the way of implementation is different.

Through cooperative learning, the learning process will be livelier, and the learning atmosphere will be more enjoyable because students will work together to achieve common goals. As stated by Ulhusna et al. [5] collaboration skills are very important in class activities because they can increase students' knowledge in achieving learning goals. Groups of students working collaboratively will produce more knowledge. Research shows that collaboration has a powerful effect on student learning and knowledge retention. The advantages of learning with the ultimate goal of collaboration are practicing effective division of labor; improving the character of student responsibility, combining information from various sources of knowledge, perspectives, and experiences; and increasing creativity and quality of solutions stimulated by the ideas of members in each group [6,7].

Collaborative learning can ultimately improve students' way of thinking in understanding learning material or taking the essence of the material. To conclude or generalize, it is necessary to pay attention to students' inductive thinking processes. This inductive way of thinking was pioneered by Taba [8]. Taba developed this inductive learning model based on the concept of students' mental processes by paying attention to students' thought processes to handle information and solve it. This learning model is designed based on constructivism theory because the design of the learning syntax is dominated by student activities in constructing knowledge based on students' own experiences. Learning begins by giving examples or special cases of concepts or generalizations. Students make several observations which then build on a concept or generalization. Students do not have to have primary knowledge in the form of abstractions but arrive at these abstractions after observing and analyzing what is observed. In this inductive activity under the guidance and direction of the teacher, students actively learn mathematics individually. Even so, students are allowed to interact with their friends, for example exchanging opinions with their peers or with friends nearby. As stated by Suryani [9] collaborative learning makes it easier for students to learn and work together, contribute ideas to each other, and be responsible for the achievement of learning outcomes as a group or individually.

Based on the background of the problems above, researchers conducted research to develop cooperative learning models in improving the mathematical generalization abilities of class VIII students of SMPN 32 Makassar.

2. Method

To answer some of the research questions above, researchers used a research & development (R&D) design regarding the theory developed by Plomp [10]. There are three main stages in this development theory, namely: (1) analyzing needs and identifying problems, (2) designing and implementing products, and (3) evaluating. These three stages are to obtain a valid, practical, and effective cooperative learning model.

This research was conducted at UPT SPF SMP Negeri 32 Makassar, South Sulawesi, Indonesia. From the user aspect, the product being developed involved two groups of participants, namely a group consisting of 31 students (1 study group) and two mathematics teachers. Meanwhile, to test the level of product validity involves two experts in assessing the product. Participants in this study were selected using a purposive sampling technique which emphasizes several considerations in determining the research sample. Data collection techniques in this development research are as follows.

a. Interview, the interview method is an attempt to obtain information by asking the respondent directly. The interview technique was used during the preliminary study to obtain information about the conditions of learning mathematics at SMP Negeri 32 Makassar.

b. Validation sheet, the validation sheet is used to collect data about the results of the validity of the developed learning model development learning tools.
c. Observation, observation sheets are used to collect data about the process of implementing learning. In this regard, to collect data about the practicality of the learning model, observation techniques are used by making direct observations of objects during the learning implementation process which include: (1) observation sheets of the implementation of learning models, and (2) observation sheets for the management of learning models.
d. Questionnaire, the teacher's response questionnaire is given after the learning process using the cooperative learning model ends to be filled according to the instructions given. Data collection using this questionnaire was carried out after completing the entire learning process using: (1) Model books, (2) Student Worksheets, (3) Learning Implementation Plans, and (4) Learning Modules.
e. Test, the test is an assessment tool used to obtain data about students' mathematical generalization abilities. In this regard, to collect data on the effectiveness of the learning model, a test of students' mathematical generalization abilities was used before the learning model was applied (pretest) and after the learning model was applied (posttest).

In research and development, two approaches are used in analyzing data, namely qualitative and quantitative approaches. Data from the needs analysis stage (results of interviews) were analyzed using a qualitative approach. The data collected from this stage is described descriptively without involving numbers. This data analysis uses thematic analysis techniques, which aim to determine the most prominent themes by analyzing the similarities and differences in participants' perceptions so as to bring up unexpected new insights [11,12].

Data analysis also uses a quantitative approach, especially in testing the validity, practicality, and effectiveness. In the validity and practicality test, the data that has been collected is analyzed quantitatively by determining the average score. Furthermore, these scores are compared with the range of score categories to assess the level of validity and practicality. Types of score ranges can be seen in Table 2.

Table 2. Category Scoring Validity

No.	**Score Range**	**Category**
1.	$3,6 \leq M \leq 4,0$	Very Valid
2.	$2,6 \leq M \leq 3,5$	Valid
3.	$1,6 \leq M \leq 2,5$	Less Valid
4.	$< 1,5$	Invalid

The practicality of learning tools for developing cooperative learning models can be seen from the implementation of the model, the teacher's ability to manage learning and the teacher's response to the use of ACI cooperative learning models (Active, Collaborative, Inductive) in the learning process. To determine the implementation (I) category of ACI cooperative learning (Active, Collaborative, and Inductive), namely:

$I \leq 1$ means not implemented
$1 < I \leq 2$ means that a small part is implemented
$2 < I \leq 3$ means mostly implemented
$3 < I \leq 4$ means everything is done

Furthermore, the analysis of model management data filled in by the teacher who implements the model is analyzed by determining the average value of the teacher's ability (TA). According to Nurdin [13] the categorization of the teacher's ability to manage learning uses the following categories:
3,5 < TA ≤ 4 means very high
2,5 < TA ≤ 3,5 means high
1,5 < TA < 2,5 means moderate
TA ≤ 1,5 means low

In addition to validity and practicality data, other data analyzed in this study is the analysis of the effectiveness of the learning model. The data collected through tests of mathematical generalization abilities were analyzed with the help of SPSS 20.00. The effectiveness of the learning model is determined by looking at the difference in scores between the pretest and posttest. The difference between the two test results is done by running a t-test. The effect of the cooperative learning model on mathematical generalization ability can be measured through the difference in scores between the pretest and posttest with the t-test.

3. Result and Discussion

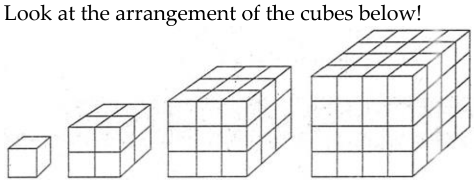
3.1. Results

1. Needs Analysis Results

In the needs analysis and problem identification stages, researchers tried to explore the views and perspectives of teachers on learning mathematics related to mathematical generalization abilities. The research results obtained information that there are still many students who experience difficulties in constructing mathematical concepts. In addition, learning mathematics is rigid, and students are not active in class. This is caused by students who still perceive mathematics as a challenging and uninteresting lesson.

The results of the interviews also state that there is no mathematics learning model that integrates mathematical generalization abilities explicitly. The majority of mathematics learning models only refer to mathematical abilities. This means that very few models of learning mathematics still encourage other skills as their learning output. Teachers also think that it is necessary to develop a more up-to-date learning model that does not only focus on mathematical abilities. They also emphasized that learning mathematics must also be linked to life skills or 21st century skills, including critical thinking, creativity, collaboration, and communication skills.

Look at the arrangement of the cubes below!



If the cube in pattern 1 is a unit cube and the next figures are arrangements of the first cube, then determine:
a. How many unit cubes are there in pattern 1, pattern 2, pattern 3, and pattern 4?
b. Draw the arrangement of wakes in the fifth order! Give the reason!
c. State a formula to determine the volume of the figure in the nth pattern!
d. Using the formula you have created, determine the volume in the fifth shape!

Figure 2. One example of a problem that is difficult for students to understand

The results of observations at the needs analysis stage also showed results that were not much different from the results of the interviews. In learning mathematics, there are still many students who tend to be passive and only accept explanations from their teachers. They are not motivated to ask questions, discuss with colleagues, or take the initiative to carry out feedback activities during learning. The majority of students are still unable to develop their capacity to collaborate and work together in solving mathematical problems. This is thought to be a factor that causes students to become passive and only "accept" what is given by the teacher. Students also experience problems in understanding one of the sample questions as shown in Figure 2. This is because students are rarely given questions related to mathematical thinking processes, namely generalization.

2. Learning Model Design

After the needs analysis is identified, the next step is to design a learning model. The first step is to design a model book which is the basis and benchmark for implementing the learning model. Active, Collaborative, and Inductive (ACI) Type Cooperative Learning Model is a cooperative learning model that emphasizes inductive ways of thinking that are obtained in an active way and collaborate with each other to achieve a learning goal that begins by providing a number of examples so that students can identify, interpret data , and make conclusions based on students' mental processes by paying attention to students' thought processes to handle information and solve it. The components of the ACI cooperative learning model developed include: (1) syntax, (2) reaction principles, (3) social systems, (4) support systems, and (5) accompaniment and instructional impacts. In addition to model books, several types of learning tools were developed, namely teaching materials, Learning Implementation Plans, and Student Worksheets.

3. Test of Validity, Practicality, and Effectiveness

The validity test was carried out by involving two experts from mathematics education and education. They are tasked with assessing the learning products that researchers have developed. From the results of the validity test, information was obtained that the learning models and tools were declared valid by experts with an average total score of 3,57. Overall, the validation results are presented in Table 3.

Table 3. Product Validation Results from Expert

No.	Development of Product	Expert Score Average	Category
1.	Model Book	3,73	Very Valid
2.	Teaching Materials (Modules)	3,67	Very Valid
3.	Learning Implementation Plans	3,47	Valid
4.	Student worksheets	3,59	Very Valid
5.	Mathematical Generalization Ability Test	3,73	Very Valid
6.	Learning Implementation Observation Sheet	3,44	Valid
7.	Learning Management Observation Sheet	3,54	Valid
8.	Teacher Response Questionnaire	3,36	Valid
	Total Score	3,57	Valid

In addition to testing the validity, learning products resulting from this development are also tested for practicality. The practicality of this learning model is determined by the results of the model's implementation, the teacher's ability to manage learning and the teacher's response after using the model. From the implementation data of the cooperative learning model type ACI, it shows that the average value of each component of the implementation of the learning model is 3,47. This indicates that the learning model developed can be categorized as fully implemented with a range of $3 < I \leq 4$. Furthermore, the data on the teacher's ability to manage mathematics learning using the ACI cooperative learning model obtained that the average teacher's ability score was 3,57 at an interval of $3,5 < TA \leq 4$, which means that the teacher's ability to manage mathematics learning using the ACI cooperative learning model was at very high category. Another instrument for measuring the practicality of this learning model is the teacher's response questionnaire. Based on the teacher's response data to the learning components, it was shown that 95% said it was very helpful, and 81.25% said it helped. The results of the analysis of the teacher's response data to the components and learning activities are in the positive criteria.

Thus, based on the practicality criteria specified in the research method, it can be concluded that the practicality criteria have been met. The product resulting from a development can be said to be practical if the product is stated to be theoretically applicable in the field and the level of product implementation is included in the good category. Assessment of the practicality of product development is based on several aspects that have the potential for teachers and students to have an interest in the product and is based on the level of implementation of learning and the results of teacher and student assessments [14].

The purpose of the practicality test and effectiveness test is to determine the level of quality of the developed learning model. Mathematics tests were given to students twice, namely in the pretest and posttest sessions. The data collected in the two sessions were analyzed using a paired sample t-test to find out whether there was a difference between the pretest and posttest scores. The results of the paired sample test are presented in Table 4.

Table 4. Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pretest - Postest	-19.59677	4.42986	.79563	-21.22166	-17.97189	-24.631	30	.000

From Table 4 it is known that the value of Sig. (2-tailed) of 0,000. That is, according to the provisions if the Sig. (2-tailed) < 0.05, it can be stated that there is a significant difference between the average scores of mathematical generalization abilities between the pretest and posttest sessions. From the results of the analysis it can be concluded that the ACI type cooperative learning model can improve students' mathematical generalization abilities. Therefore, this type of ACI cooperative learning model has proven to be effective so that it is feasible to be used widely.

3.2. Discussion

The results of a preliminary study conducted at UPT SPF SMP Negeri 32 Makassar show that the models and learning tools owned by mathematics teachers have not been fully developed independently. Mathematics books for teachers and students used in the learning process come from the Ministry of Education and Culture. Teachers and students only have these learning resources and also rarely use learning media to help students master or understand the concepts of mathematical material. Even though technological developments in the world of education are increasing rapidly, teachers must also be better prepared in implementing innovative learning media, so that material can be conveyed to students properly. The creative ability of teachers in the world of education is an important requirement, including junior high school mathematics teachers. Therefore, every teacher must be able to carry out a learning innovation. Teachers have a very strategic role in the learning process [15][16].

The teacher has prepared and has learning tools, but the devices they have have not been updated or are still using examples of devices from the last 5 years. his school. As a result, the learning model applied in class is less varied. The teacher has implemented group or cooperative learning in class, but it is not optimal. This is because students are immediately asked to search, discuss, and present the results of their discussions in class. As a result, students who have high mathematical abilities will tend to solve them quickly and students with low abilities only need to receive discussion reports, so that active group collaboration does not occur. In addition, from the results of interviews with students they stated that they did not understand the concepts they had discussed because at the beginning of the lesson the teacher did not provide guidance on the material. Students are only assigned to search and discuss in their respective homes, so the teacher does not know which students are active in group work. As stated by Alviyah et al. [17] in his research that in reality most teachers are focused on the learning process, teachers are only fixated on what is conveyed and very rarely involve students in thinking, reasoning and the process of discovering the concept itself . From the results of this analysis, this indicates that the development of learning models by teachers has not been done much. Therefore, researchers develop a cooperative learning model that can activate students in collaborating, thinking/reasoning, concluding a concept and communicating ideas/opinions between students and students and students and teachers. One of the cooperative learning models developed is the Active, Collaborative, and Inductive cooperative learning model. As the results of research conducted by Tharayil et al. [18]; Nicol at al. [19], Owens, Le Coze, MacIntyre, & Eastwood [19]; Kawuri, Ishafit, & Fayanto [20] that active discussion activities in this class are certainly very good for students in learning.

The success of mathematical generalization abilities is based on the indicators used. Each phase applied in the model also reflects indicators of students' mathematical generalization abilities. The following are the steps for implementing the active, collaborative, and inductive cooperative learning model (ACI):

Stage 1. Active

In the active stage, students observe the pictures in accordance with the sub-subject matter/material and identify and mention data one by one from the pictures. In this case, the materials provided are flat side shapes (cubes, blocks, prisms, and pyramids). In accordance with the needs analysis that has been carried out, there have been changes to the concept before and after. So, in carrying out this research, the researcher conveyed the learning objectives of the material at meeting 1, namely students could define their own concepts of flat side shapes (cubes, blocks, prisms, and pyramids), previously students were directly asked to find the surface area and volume of the shape. flat side chamber. Thus, prior to the implementation of this ACI type model, students only received information from one source, namely from a book issued by the Ministry of Education and Culture.

When observing the pictures contained in the student worksheets that has been given, each group is asked to actively seek information from any source, either from the prepared learning modules or from the internet. The search for information needed at that time was to identify the characteristics contained in the image by mentioning the characteristics one by one starting from the base, the peak point (if any), and the shape of the sides or other things found by students. Here, the teacher acts as a motivator so that students are actively involved in these learning activities. As with Bruner's theory, a good way of learning is discovery learning, namely learning by means of enactive, iconic, and symbolic presentations. An enactive presentation is through teacher action, an iconic way through a set of images that represent a concept and a symbolic way of using words or language [21].

Stage 2. Collaboration

At the collaboration stage, students group data into similar categories and label the names of these groupings. In this grouping, students associate previous knowledge with what they have now. Students already know the properties of flat shapes in advance so they can classify flat side shapes into similar categories. This is also in accordance with Ausubel's theory [22] that the way students relate the material given to existing cognitive structures, namely in the form of facts, concepts, and generalizations that students have learned and remembered. Here, the teacher explores the level of understanding of students regarding the observations made and knows the difficulties encountered when looking for information about the characteristics of the image. Also at this stage, students are asked to continue to have discussions with their group mates, and if necessary share the roles and tasks of each group member so that the discussion continues and is in accordance with common goals.

Stage 3. Inductive

The last stage is the inductive stage, students identify patterns that are formed and find general patterns to make generalizations. Students make general conclusions from the observations made in stages 1 and 2. The teacher acts as a facilitator to provide instructions in making generalizations through questions. At this stage, students also conclude the results of their discussions and present them through the visiting-work learning model. After the presentation, students use the results of their generalizations to solve the given mathematical problems.

One of the factors that causes students' mathematical generalization abilities to increase is the application of Active, Collaborative, and Inductive (ACI) cooperative learning models. Because the principles contained in the ACI type find their own concepts through an inductive thinking process from a number of observations made collaboratively on flat sided geometric material so that students can understand the material. Learning with the ACI cooperative learning model can train students to be active in learning activities, actively ask questions, express opinions and knowledge they have learned in modules and student worksheets. This result is in line with the opinion Yuni & Fisa [23] that whatever the students' opinion when generalizing, this is appreciated by the teacher and perfected with teacher guidance, not blamed but corrected. The importance of generalization ability is that it can help students know how far they understand the material, improve good communication, expand insights so that students are able to make a decision or conclusion quickly and accurately [24]. The results of this study were also supported by the research of Dani et al [25] which revealed that through the Realistic Mathematics Education approach it had a positive influence on improving students' mathematical generalization abilities because through this model it is customary to give students various kinds of questions related to everyday life and involve students to active in learning with the aim of maintaining student confidence during the learning process.

The advantage of this type of ACI cooperative learning model is that students have an active opportunity to find concepts inductively so that students are involved in thinking and understanding concepts together (groups). When compared with other cooperative learning models, this type is more specific towards a generalization. At the beginning of learning, the teacher does not explain or explain this subject, instead it is the students who have to learn independently and construct their knowledge of the material. This learning model emphasizes collaborative so that each member of the group must participate in carrying out their duties and responsibilities. Each phase in this model also has more active students both in thinking, collaborating, explaining the results of their thoughts (presentations), and concluding in general.

4. Conclusion

Based on the results of the analysis and discussion of the research that has been put forward, it can be concluded that several main points related to the development of Active, Collaborative, and Inductive cooperative learning models in improving the mathematical generalization abilities of junior high school students are as follows: (1) Information needs of junior high school teachers and students through interviews and document analysis found that both teachers and students really need the development of learning models that can improve students' mathematical generalization abilities. (2) The cooperative learning model can improve the mathematical generalization abilities of junior high school students which includes 3 stages of learning, namely the active stage, the collaborative stage, and the inductive stage supported by the rational model and its supporting theories, model components and instructions for using the model. (3) Cooperative learning models of Active, Collaborative, and Inductive types in improving the mathematical generalization abilities of junior high school students are supported by learning tools and are declared valid, practical, and effective.

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