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# The implementation of cooperative learning type team assisted individualisation for teaching 3D geometry

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**ABSTRACT**

This study aimed to investigate the effectiveness of a cooperative learning type TAI for teaching 3D geometry and to see whether or not the outcome of cooperative learning type TAI was found better for teaching 3D geometry rather than conventional learning model. This study was a experiment with pretest posttest only control design. The sample are 70 students on the first grade of MA Ismailiyah, Jombang. The sample randomly divided into two classes, that is experimental class and control class. The experimental class used the cooperative learning type TAI, while the control class used the conventional learning model.The instruments consisted of observation sheet for students' activities, observation sheet for students' cooperative skills, questionnaire of students' responses and test sheet of learning outcome. The findings showed that the implimentation of a cooperative learning type TAI for teaching 3D geometry is effective and the outcomes of the students taught 3D geometry using TAI were found better than ones taught using a conventional learning model.



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## 1. INTRODUCTION

The Ministry of Education and Culture of Republik Indonesia, in developing curriculum for elementary schools, junior high schools, high schools, and vocational high schools, has adapted 21st-century learning models in order to address this current increasingly competitive era. Within 21st-century learning models, teachers give chances for students to responsibly express their ideas and thoughts represented in 21st-century knowledge-skills rainbow. Through group and cooperative learning models, teachers should train their students to collaborate and cooperate, including in mathematics.

Mathematics learning emphasizes students' ability to think. Students must be challenged and encouraged to develop their thinking skills through asking, discussing ideas, strategies, and solutions in solving problems [1]. Solving mathematical problems requires the ability of argumentation [2]. Through argument, problem solver define, generate and support reasonable actions to get the right answer [3]. Educators must help students to construct a valid mathematical argumentation [4]. But mathematics instruction in Indonesia is still conventional [5]. Mathematics learning is dominated by the introduction of verbal formulas and concepts, without sufficient attention being given to the understanding of students [6]. Students just listen, then imitate or copy what the teacher gives without initiative. Students are not encouraged to develop their thinking skills. Students are not allowed or invited to optimize their potential, to develop their skills. The mathematics instruction is also considered to be too unstructured to develop student personalities [7].

The characteristic of learning mathematics, based on constructivism perspective, is that students should actively get involved in learning processes and any new information should be related to other information unified for the sake of students' schemata so that they may reach a complex information (subject matter), and investigation-and-discovery-oriented learning basically deals with problem solving. Learning mathematics is an attempt to help students construct (build) mathematical principles with their own skills through internalization so that they may rebuild those principles. Transformations of the obtained information may become new constructs or principles. Such transformation can easily happen when students have successfully come into comprehension since they have schemata on hand. Learning mathematics in the wake of the communication, idea and ideas together in a group [8].

Teachers may use cooperative learning model to reach the 21st century knowledge-skills rainbow and to reach mathematics learning goals. Cooperative learning is a learning strategy emphasizing on cooperative behavior and attitudes to work together or help each other in a regular structure of cooperation in group consisting two or more pupils. Cooperative learning is a learning strategy involving a number of students with different skills as participants in small groups. In completing the group tasks, each member of the groups needs to work together and help each other to comprehend the subject matter. Mathematical learning is more effective by using cooperative [9-12].

One type of cooperative learning model is Team Assisted Individualization (TAI). This type of cooperative learning model is an innovative learning model which brings students into an active learning environment [13-15]. TAI have simple procedures that are easy to understand, remember, and apply [16]. Besides, TAI adapts instruction to students' individual needs. The characteristic of TAI is that each student individually learns a subject matter the teacher has already prepared. Those individual works will be spread out to groups to discuss, and all the participants will be responsible to the answers as shared responsibility.

Cooperative learning with TAI type can be applied on mathematics as well since one particular feature of learning mathematics is mathematical problem solving, whether or not it is related to real life. Cooperative learning may encourage students' motivation to help each other in solving mathematical problems. TAI is appropriate in for mathematics classes regarding the academic achievement [16]. TAI has a more significant effect than STAD on student academic achievement in mathematics [10]. TAI had a positive effect on academic achievement in mathematics [15, 17]. So TAI can be applied in mathematics learning, therefore the authors use TAI to be implemented in mathematics learning on three-dimensional geometry.

One mathematics subject matter which may correspond to this type is tree-dimensional (3D) geometry. 3D figure consists of block, cube, ball, tube, prism, and pyramid. In high school grade, students no longer learn the element, the surface area, and the volume of those figures. Rather, they draw those figures using ruler and arch. The students may use their know-how on drawing 3D figures to design a beautiful and majestic building like Borobudur temple and the skyscrapers.

In learning 3D geometry, students must be actively involved and this will be fulfilled in a laboratory. Mini laboratory is a model of practical activities with simple equipment that can be done in the classroom, so that students are directly involved in building knowledge through physical activity / demonstration. Through student manipulation / demonstration activities will gain a better knowledge and long lasting. Thus in mini laboratory activities students are required to be able to demonstrate the tools in constructing the concepts and principles learned. Therefore, the mini laboratory method is considered more appropriately combined with cooperative learning type TAI.

This study aimed to investigate the effectiveness of instruction using cooperative learning type Team Assisted Individualization teaching 3D geometry and to see whether or not the learning outcome of 3D geometry with Team Assisted Individualization is better rather than the learning outcome using conventional approaches. This study proposed a hypothesis that the learning outcome of the students applying Team Assisted Individualization is better than the students using conventional approach in learning 3D geometry.

The effectiveness of instruction contains four indicators including the quality of instruction, the appropriate levels of instruction, incentives, and time [18]. From students' perspective, however, the effectiveness can be measured by looking into the students' interest in learning activities. Such interest may affect their learning outcome. If students are not interested in learning something, they will not succeed in that learning. Whereas, if they learn based on their interest; they may perform better. In addition, learning is considered effective when the students actively get involved in organizing and seeking for information (knowledge). They do not just passively receive any information their teacher gives them. Thus, this study inferred that the indicators of the effectiveness of cooperative learning model type TAI for teaching 3D geometry were (a) the achievement of students' learning outcomes; (b) students' activities on learning; (c) students' cooperative skills; and (d) students' responses on learning. In this study, cooperative learning type

TAI was considered effective if, at least, 3 of those 4 indicators were met with one condition that the first indicator must be first met.

Cooperative learning type Team Assisted Individualization (TAI) is identified as an attempt of designing an individual learning model which may solve problems dealing with ineffective learning models. Using TAI, students are divided into heterogeneous small groups (consisting of 4 to 5 pupils) in order to complete a given group task and then the teacher may individually help the students in needs. The heterogeneity of the groups includes gender, race, religion (if possible), the levels of skills (high, moderate, low), and etc. TAI is used for several reasons, first, this model combines the advantages of cooperation and individual learning program. Second, this model emphasizes on the social effects of cooperative learning. Third, TAI is designed to solve problems in a learning program. In terms of students' individual learning difficulty, for instance, this model gets students to work in cooperative learning groups and take responsibility to do regular inspection and management, help each other in solving problems, and give encouragement to succeed [19]. TAI has eight components. Those eight components are presented on Table 1.

Table 1. Components of cooperative learning type team assisted individualization

| Components | Teacher actions |
|---|---|
| Placement Test | Teacher gives a pre-test to the students or look into their mean daily scores in order to see the students' weakness on particular fields. |
| Teaching Group | Teacher gives material in a brief manner before he/she gives a group task. |
| Teams | Teacher divides the students into heterogeneous groups consisting of 4 to 5 pupils. |
| Team Study | Teacher asks the students to work in group. Students work collaboratively by using worksheets to solve problems. Each group, given a set of equipment and props that match the needs of mini laboratories in each lesson plan. To solve the problem in the worksheet, students work in accordance with the stages in the implementation of mini laboratory activities and cooperative learning principles. Teacher will individually help students. |
| Student Creative | Teacher asks the students to do tasks in groups, and the individual achievement of each student depends on their group performance. |
| Team Score and Team Recognition | Teacher gives score on group work and provides criteria of achievement for well-performed groups and bad-performed ones. |
| Fact test | Teacher conducts small tests based on facts from the students |
| Whole-Class Units | Teacher gives material at the final phase of teaching with problem-solving strategy. |

Conventional mathematics learning is the learning that is commonly used by Indonesian teachers in teaching mathematics in schools, that is learning that begins with the exposure of material, then given examples of problems and end with practice questions. The training questions are usually not much different from the example problem, the difference lies only in the numbers used in the question. Conventional math learning prefers memorization rather than understanding, emphasizing numeracy skills, prioritizing outcomes rather than processes and teaching is still teacher-centered. During the learning activities, teachers tend to dominate the learning activities, and there is almost no interaction between students, so students tend to be passive. Students only listen and write, when given the opportunity to ask only a few students who ask questions to the teacher.

## 2. RESEARCH METHOD

This study is a experiment. It used pre test - posttest only control design. In post-test-only, the two classes were given the same test as the final test. The result of those two classes would be compared (the difference of the two result was tested). This study was conducted at the first grade of Islamic High School on an even semester in 2016/2017 teaching period. All pupils of the first grade in that school were selected as the population of this study, and two classes were then further randomly selected as the sample. One class was determined as the experiment class, which was taught using cooperative learning type TAI. Another one was determined as the control class, which was taught using conventional model. The number of students in the control class is 34, while the number of students in the experimental class is 36 students.

The instruments of this study consisted of observation sheet for students' activities, observation sheet for students' cooperative skills, questionnaire of students' responses and test sheet of learning outcome. The observation sheet for students' activities was used to seek for data related to students' activities during the process of learning mathematics. The data were then analyzed using percentages based on time allocation set in teaching plan. The effectiveness of students' activities corresponded to the ideal activities indicated by predetermined ideal timing. Table 2 presented the criteria of ideal time limits and the effectiveness tolerance of students' activities.

Table 2. Criteria of ideal time limits and the effectiveness tolerance of students' activities

| Students' Activities | Idea Time (%) | Criteria of Effectiveness (%) |
|---|---|---|
| Actively listening/paying attention on teacher'/classmates' explanation. | 10 | 5 – 15 |
| Completing Student Task Sheet | 20 | 15 – 25 |
| Discussion/Q&A between students and teacher | 30 | 25 – 35 |
| Discussion/Q&A between students | 20 | 15 – 25 |
| Communicating groups' works | 20 | 15 – 25 |
| Irrelevant attitudes on learning activities | 0 | 0 – 5 |

Students' activities were considered effective if the time spent for each category of those activities in each meeting corresponded (MC) to the time allocation set in teaching plan with tolerance percentage on 5%. The observation sheet for students' cooperative skills was used to seek for data related to students' cooperative skills. The data was obtained from observation in particular time interval when the students were having a group activity during their learning process. It was then analyzed by calculating the frequency and the mean percentages of each aspect of students' cooperative skills. The achievement criteria of effectiveness on each of those aspects were based on the percentage of ideal time with tolerance limits on 5% for each aspect. Table 3 presented the criteria of ideal time and the effectiveness limits of Students' activities in cooperative learning aspects.

Table 3. The criteria of ideal time and the effectiveness limits of cooperative learning aspects

| Student's Cooperative Skills | Ideal Time (%) | Criteria of the Effectiveness Limits (%) |
|---|---|---|
| Feeling in-duty | 100 | 95 – 100 |
| Taking turn and task-sharing | 60 | 55 - 65 |
| Encouraging participation | 30 | 25 - 35 |
| Actively listening | 30 | 25 - 35 |
| Asking | 20 | 15 – 25 |

Note: Students' cooperative skills were considered effective when all those above aspects were in ideal time as expected.

Questionnaires of students' responses were used to seek for data dealing with students' responses on their learning activities using cooperative learning type TAI. Student responses that include the learning components, newness of learning components, interest in participation of the learning process, clarity of learning Media, and interest of learning media. The students were considered having positive response when they found pleasure, something new and clear, and felt interested within. The data was then analyzed using descriptive statistic with percentages. The percentages were then calculated with the following formula. Note that the students' responses were considered positive if the percentage of positive responses was at least 80% for each aspect.

$$\frac{\text{The number of students' responses on each aspect}}{\text{the total number of the students}} \times 100\% \tag{1}$$

Test sheet of learning outcome was used to seek for data of students' learning outcome in learning 3D geometry with TAI. In order to address the second research question and to test the hypothesis proposed in this study, the researcher used inferential statistical analysis to analyze student learning outcomes. Learning result data was analyzed by covariance analysis (anakova), because in this study used covariate variable as independent variable which is difficult to be controlled but can be measured together with dependent variable. The covariate variable, ie the student's initial ability (pretest) is symbolized by X. The dependent variable, ie the learning outcomes of students after learning (posttest) is symbolized by Y. Anakova may be used if the requirements of the anakova test are met. The terms are:

a. There is influence of covariate variable (X) to dependent variable (Y). This can be known through the independence test (significance test of regression model coefficients).
b. Regression model is linear. This can be known through the linearity test of the regression model.

The regression model for the experimental class and the control class is the same or homogeneous. The similarity of experimental class regression model and control class can be known through equality test of two regression models. If the two regression models are not equal, it is necessary to test the homogeneity of regression coefficients, to determine the homogeneity or alignment of the regression model.

## 3. RESULTS AND ANALYSIS

The result of observation on students' activities for 6 meetings was presented in percentage shown in Table 4.

Table 4. The observational result of students' activities (experiment class)

| No | Aspect of Observation | Percentage of Students' Activities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | MC 1 | MC 2 | MC 3 | MC 4 | MC 5 | MC 6 | Mean |
| 1 | Actively listening/paying attention on teacher'/classmates' explanation. | 11.26 | 11.26 | 11.56 | 12.56 | 13.40 | 14.02 | 12.34 |
| 2 | Completing Student Task Sheet | 19.05 | 19.10 | 19.00 | 19.02 | 19.05 | 19.05 | 19.05 |
| 3 | Discussion/Q&A between students and teacher | 27.78 | 28.25 | 28.37 | 29.06 | 29.05 | 29.55 | 28.68 |
| 4 | Discussion/Q&A between students | 22,05 | 22.32 | 22.48 | 22.48 | 22.48 | 22.48 | 22.45 |
| 5 | Communicating groups' works | 18.04 | 86.36 | 18.41 | 18.52 | 18.52 | 18.50 | 29.73 |
| 6 | Irrelevant attitudes on learning activities | 1.00 | 0.80 | 0.74 | 0.68 | 0.00 | 0.00 | 0.54 |

Based on Table 4, compared to the criteria presented in Table 2, all of the aspects in learning process were effective. Thus, the students' activities in learning 3D geometry with TAI mode were considered effective. This was due to the fact that the teacher did not dominate the teaching-learning process. It was supported with the research data which resulted in 12.34 on students' mean activities dealing with listening aspect or paying attention on teacher/classmates. Overall, it showed that cooperative learning with TAI model was student-centered. Therefore, cooperative learning type TAI on 3D geometry gave the widest chances for students to actively get involved and develop their individual and group concepts. Students might actively learn how to discuss and work together, and discover principles in solving problems. Thus, the students' learning activities were effective. Based on Table 5, it showed that all the aspects were in effective category. Thus, cooperative learning type TAI for 3D geometry might evoke students' cooperative skills in effective manner.

Table 5. Students' cooperative skills (experiment class)

| No. | Aspects of Observation | Percentage of Cooperative Skills | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | MC 1 | MC 2 | MC 3 | MC 4 | MC 5 | MC 6 | Mean |
| 1 | Feeling in-duty | 98.29 | 95.39 | 97.59 | 97.89 | 98.89 | 98.89 | 97.82 |
| 2 | Taking turn and task-sharing | 58.76 | 57.02 | 57.02 | 57.56 | 58.00 | 59.00 | 57.89 |
| 3 | Encouraging participation | 33.12 | 26.32 | 30.70 | 26.56 | 25.56 | 25.56 | 27.97 |
| 4 | Actively listening | 30.98 | 26.32 | 26.32 | 28.00 | 28.00 | 30.00 | 28.27 |
| 5 | Asking | 16.03 | 18.64 | 18.93 | 15.11 | 17.11 | 16.04 | 16.98 |

The result of questionnaires dealing with students' responses was presented shown in Table 6. Based on Table 6, Table 7, Table 8, Table 9, and Table 10, those all showed that most of the students gave positive responses on cooperative learning type TAI in learning mathematics with 3D geometry as the subject matter. In short, the responses were positive. The total maximum score of testing the students' learning outcome was 100. A student was considered as one successfully completing the learning process when he/she got score at least 65 or 65% of the total score. The learning completion was classically considered if at least 85% of the total students in class had completed their learning. The data comparison between experiment class and control class was presented in Table 11.

Table 6. Students' responses on learning components (experiment class)

| Teaching Components | Feeling pleased (%) | Feeling unpleased (%) |
|---|---|---|
| Subject Matter | 100 | 0 |
| Student Task Sheet | 91.65 | 8.35 |
| Quiz | 100 | 0 |
| Learning circumstance in class | 89.88 | 10.11 |
| The way teacher teaches | 98.25 | 1.75 |

Table 7. Students' Responses on Learning

Table 8. Students' Interest in Participation of the

Components (Experiment Class)

| Teaching Components | New (%) | Old (%) |
|---|---|---|
| Subject Matter | 81.60 | 18.40 |
| Student Task Sheet | 82.35 | 17.65 |
| Quiz | 90.88 | 9.12 |
| Learning circumstance in class | 85.30 | 14.70 |
| The way teacher teaches | 90.45 | 9.55 |

Learning Process (Experiment Class)

| Interested (%) | Not interested (%) |
|---|---|
| 97,22 | 2,78 |

Table 9. Students Reponses on Learning Media (Experiment Class)

| Students' Responses | Clear(%) | Unclear (%) |
|---|---|---|
| 1. Students Task Sheet | 89.92 | 10.08 |
| 2. Quiz | 88.89 | 11.11 |

Table 10. Students' Responses on Learning Media (Experiment Class)

| Students' Responses | Interested (%) | Uninterested (%) |
|---|---|---|
| 1. Students Task Sheet | 97.22 | 2.78 |
| 2. Quiz | 94.44 | 5.56 |

Table 11. Comparison of learning outcomes between the experiment class and the control class

| Comparison | Experiment Class | | Control Class | |
|---|---|---|---|---|
| | Pretest | Postetst | Pretest | Postetst |
| The number of students | 36 | 36 | 34 | 34 |
| Mean score of students' learning outcome | 56,22 | 72.36 | 29,79 | 48.44 |
| Standard deviation | 5,09 | 7,79 | 16,71 | 16,88 |
| The number of students completing their learning | - | 32 | - | 7 |
| The percentage of students completing their learning. | 0.00 | 88.89 | 0.00 | 20.59 |
| The learning completion in classical manner | Incomplete | Complete | Incomplete | Incomplete |

Based on Table 11, it showed that 32 (88.89%) of 36 students in experiment class had successfully completed their learning. This implied that in classical manner, the students' learning outcome on cube and block in experiment class was complete. Whereas, there were only 7 (20.59%) of 34 students in control class completed their learning. Classically, the subject matter of cube and block in control class was incomplete. The achievement of effectiveness on cooperative learning type TAI was based the students' completion, activities, cooperative skills, and responses on learning. Those all were presented in Table 12.

Table 12. The achievement of learning effectiveness

| No | Category | Achievement | Explanation |
|---|---|---|---|
| 1 | Learning completeness in classical manner | 88.89 % | Completed |
| 2 | Students' Activities | Each aspect was fit | Effective |
| 3 | Students' Cooperative Skills | Each aspect was fit | Effective |
| 4 | Students' Responses | 80.56% | Positive |

Based on Table 12, it concluded that cooperative learning type TAI was effective for teaching 3D geometry at the first grade of Islamic High School Ismailiyah, Jombang. Thus, the hypothesis of this study was supported. The data of students' learning outcome was analyzed using covariance in order to see whether or not the learning outcome of the students applying cooperative learning model type TAI on 3D geometry was found better than using the conventional one.

Regression model on experiment class was $Y_E = 35.33 + 0.65 X_E$ (2)

Regression model on control class was $Y_K = 31.58 + 0.56 X_K$ (3)

The constant of regression line on experiment class was 35.336. It was higher than the control class which reached 31.58. In geometry, the regression line of experiment class was found higher than the control one. This indicated that the students' learning outcome using cooperative learning type TAI on 3D geometry was better than using the conventional one. The following table presented the result of analysis for the test of independency of the regression model of the experiment class.

For the standard of significance $\alpha$ = 5%, it obtained F(0,95;1;34) = 4,130. Thus, F* > F(0,95;1;34) so that $H_0$ was not supported. It indicated that the students' initial skills (X) had significant impact on their learning outcome (Y). The Table 13 presented the result of analysis for the test of independency of the regression model of the experiment class. While the Table 14 presented the result of analysis for the test of independency of the regression model of the control class.

Table 13. Anava for the test of independency of the regression model of the experiment class

| Source of Varians | SS | Df | MS | F* |
|---|---|---|---|---|
| Regression | 393.887 | 1 | 393.887 | 7.730 |
| Error | 1732.419 | 34 | 50.953 | |
| Total | 2126.306 | 35 | | |

Tabel 14. Anava for the test of independency of the regression model of the control class

| Source of Varians | SS | Df | MS | F* |
|---|---|---|---|---|
| Regression | 4493.504 | 1 | 4493.504 | 29.304 |
| Error | 4906.878 | 32 | 153.340 | |
| Total | 9400.382 | 33 | | |

For the standard of significance α = 5%, it obtained F(0,95;1;32) = 4.149. Thus, F* > F(0,95;1;32), so that $H_0$ was not supported. It indicated that the students' initial skills (X) had significant impact on their learning outcome (Y). The following table presented the analysis result of the test of linearity of regression model on the experiment class.

For the standard of significance α = 5%, it obtained F(0,95;8;26) = 2.321. Thus, F* < F(0,95;8;26) so that $H_0$ was supported. It indicated that the regression model of the experiment class was linear. Therefore, the students' initial skills (X) and their learning outcome (Y) had a linear relation. The following Table 15 and Table 16 presented the analysis result of the test of linearity of the regression model of the experiment class and the control class.

Table 15. Anava for the test of linearity of the regression model of the experiment class

| Source of varians | Sum of Squares | df | Mean Squares | F* |
|---|---|---|---|---|
| Regresssion | 393.887 | 1 | 393.887 | 7.730 |
| Error | 1732.419 | 34 | 50.953 | |
| Lact of fit | 146.169 | 8 | 18.271 | 0.299 |
| Pure error | 1586.25 | 26 | 61.010 | |

Table 16. Anava for the test of linearity of the regression model of the control class

| Source of varians | Sum of Squares | df | Mean Squares | F* |
|---|---|---|---|---|
| Regresssion | 4493.504 | 1 | 4493.504 | 29.304 |
| Error | 4906.878 | 32 | 153.340 | |
| Lact of fit | 147.128 | 14 | 10.509 | 0.040 |
| Pure error | 4759.75 | 18 | 264.431 | |

For the standard of significance α = 5%, it obtained F(0,95;14;18) = 2,290. Thus, F* < F(0,95;14;18) so that H0 was supported. It indicated that the regression model of the control class was linear. Thus, the students' initial skills (X) and their learning outcome (Y) had a linear relation. The following Table 17 and Table 18 presented the analysis result of the test of similarity of the two regression models. Based on Table 17, it obtained the linear regression of the composite data as (4).

$$\hat{Y} = 27.980 + 0,755X \tag{4}$$

For the standard of significance α = 5%, it obtained F(0,95;2;66) = 3,136. Thus, F* > F(0,95;2;66) so that H0 was not supported. It indicated that the regression model between the experiment class and the control class was not similar, thus, a homogeneity test of the coefficient of regression was conducted. The following table presented the result of that test.

Table 17. Anava for the test of similarity of the two regression models

| Bo | b1 | SSE(R) | SSE(F) | F* |
|---|---|---|---|---|
| 27.980 | 0.755 | 8795.069 | 6639.297 | 10.751 |

Tabel 18. Anava for homogeneity test of the coefficient of regression

| A | B | F* |
|---|---|---|
| 8182.1 | 8189 | 0.057228 |

For the standard of significance α = 5%, it obtained F(0,95;1;66) = 3,98. Thus, F* < F(0,95;2;66) so that $H_0$ was supported. It indicated that the regression model between the experiment class and the control class was equal. This indicated that the students' learning outcomes through TAI were different from those through conventional model [20-22]. The TAI type cooperative learning model is a learning model that allows students to experience for themselves what they learn, students to strengthen, expand and apply their academic knowledge and skills in various kinds of life skills both at school and outside school [23]. So that there is student stagnation in constructing understanding of mathematical concepts.

The results of this study support the results of the study [24] that TAI learning, students have great motivation in learning so that it will produce good mathematics learning achievement. Students are able to work well together between students who are both smart and less smart. Many students are interested in the introduction of interesting material, it can be seen from the enthusiasm of students when participating in the learning process. Application of Individual-Assisted Individualization (TAI) in mathematics learning as an effort to improve student achievement, attitudes, and motivation [25]. In addition, cooperative learning type Team Assisted Individualization (TAI) can optimize the ability of students to discuss and interact with each other so that their mathematical communication skills increase [26].

Implementation mini laboratory in the classroom by using simple tools or concrete objects as 3D wake-ups. This mini laboratory is designed to allow students to study independently in exploring mathematical concepts using props. Its activities include the study of concepts, theories, ideas, and facts with the help of concrete objects, as well as manipulated mathematical models. In mini laboratory activities involving students in learning with scientific method, so it can be used to train students' thinking skills.

In a mini laboratory, the activities are focused on the students. Students themselves who work to demonstrate the tools to manipulate the concepts and principles learned and make conclusions from the results of their activities, teachers only serve to supervise and direct students in conducting activities in accordance with the instructions contained in the worksheet and guide students by providing directives as needed in make a conclusion.

If the laboratory can be functioned properly, it will support the success of the teaching and learning process in schools and assist teachers and students in producing scientific work as a form of application of concepts [27].

Implementation cooperative learning type TAI with mini laboratory will succeed when problem solved by student is not too difficult and can be done by using concrete object. Therefore the appropriate material criterion taught by using a mini laboratory is the material can be presented through the manipulation of concrete objects and the understanding of matter can be approximated by inductive reasoning.

## 4. CONCLUSION

Based on the result of descriptive analysis, it found that by applying cooperative learning type TAI on 3D geometry, the completeness of learning reached 88.89%, the students' activities and their cooperative skills reached the criteria of effectiveness, and the students' responses were positive as well. Based on the criteria of effectiveness in learning process, it concluded that cooperative learning type TAI was found effective to teach 3D geometry at the first grade of MA Ismailiyah, Jombang. However, based on the analysis of inferential statistic, the students' mathematical learning outcome using cooperative learning type TAI on 3D geometry was found better than using conventional learning model.

Researchers suggest to teachers and who are responsible in the field of learning mathematics in order to apply cooperative learning type TAI in teaching the material wake up space, especially in students whose cognitive development is still in concrete operation phase. TAI type cooperative learning can be developed for other subjects, this is because cooperative learning type TAI can enable students to find concepts that must be learned by themselves by working together in groups for the achievement of learning objectives.

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