Effectiveness of the application of team games tournament cooperative learning model (TGT) to improve learning outcomes of students of class XI science 1 SMA Frater Makassar in the principal material of salt hydrolysis

J J Pongkendek, J Y Parlindungan and D N Marpaung
Department of Chemistry Education, Faculty of Teacher Training and Education, Universitas Musamus, Merauke, Indonesia
E-mail: pongkendek@unmus.ac.id

Abstract. This research is descriptive research that has aimed to find out the effectiveness of learning after applying cooperative learning model TGT type. The subjects of research are 35 students of the XI Science 1 Class of equated SMA Frater Makassar, the class had 41% class comprehensiveness on the same main topic last year. The data is post test result has been validated by two evaluators. Description of students learning outcomes are: (1) the average score of students is 75.57 from 100 as ideal score with the highest and lowest score are 95 and 35, respectively; (2) the students who master comprehensively the subject are 31 from 35 students or have 88.57% class comprehensiveness. The conclusions of this research are the effectiveness of applying the learning model is 68.57%.

1. Introduction
Effectiveness simply shows the results of a process, in the context of learning, effectiveness shows the results of a teaching and learning process that describes the quality of the process. Thus the effectiveness of learning is indicated as the level of success in achieving learning objectives. Kemp and Diamond [1] states that how to measure the effectiveness of learning outcomes starts from a question: What have students achieved? To answer this question, it must be known how many students have succeeded in achieving all the learning objectives within the specified time. The specification of the amount is expressed as a percentage. Then the data on the results achieved by each student is summed from all the information that has been achieved by the teacher.

Learning is something that is done by students not made for students, so students who must be actively involved in learning. The role of educators in learning is to help students carry out learning activities. The efficiency and effectiveness of learning activities carried out by students is a learning goal [2].

The learning process must provide opportunities for students to be actively involved in building their own concepts, wherein student learning becomes the center [3]. Teachers are no longer the center of learning, but actively involve students in every learning activity[4]. The position of the teacher is very strategic in creating a conducive and pleasant learning atmosphere so that it can direct students to achieve their learning goals optimally. Teachers are required to have adequate abilities in carrying out
their learning activities and must be able to realize an effective learning environment and are better able to manage their classes so that the learning achievements of students are high [5].

In fact in the field, the teaching and learning process of most teachers still emphasizes its role as the material delivery without involving students in the learning process. Students are not invited to engage in thinking during the teaching and learning process, so students are only passive to accept the concept conveyed by the teacher. Though chemistry subjects are often considered difficult by students. As a result, many students are lazy to study chemistry.

The selection of learning models is very important so that students can learn well. A teacher is required to be able to determine the appropriate learning model for a particular concept. Therefore, the author chooses a learning model that can make students more active and able to learn more effectively and efficiently without making them bored and bored. One of them is a cooperative learning model. Cooperative learning can make learning effective because in the learning process students learn and interact with peers and their teachers [6]. Among the various types of cooperative learning models, what is used in this research is the type of team games tournament (TGT).

TGT cooperative learning is learning where after the presence of the teacher, students move to their respective groups to help each other answer questions from the material provided [7]. The teacher will no longer hold a written test to evaluate the learning outcomes, but each student will compete in each tournament table at the end of the lesson. The tournament must allow all students from the ability level to contribute points so that the questions are made based on their level of ability [8]. The value of each student will be accumulated into group values. According to Muharram [7], the stages that need to be considered in TGT cooperative learning are group formation, material giving, study group, tournament, individual score, group score, and appreciation.

| Table 1. Group Award Criteria |
|-----------------------------|
| Average Score | Predicate |
| ≥ 45 | Superteam |
| 40-45 | Great team |
| 30-40 | Good team |

Learning outcomes are abilities possessed by students after they receive learning experiences [9]. He pointed out that, in the national education system the formulation of educational goals, both curricular and instructional goals, uses the classification of learning outcomes from Benjamin Bloom, which broadly divides them into three domains, namely: cognitive, affective, and psychomotor. In addition, learning outcomes can be operationalized in the form of indicators in the form of report cards, study achievement indexes, graduation rates, and predicates of success [10]. Thus, it can be said that learning outcomes are actual abilities that can be measured and are tangible mastery of science, attitudes of skills, and values achieved by students as a result of the learning process in school. Learning outcomes obtained by students in a subject are expressed in the form of values called learning outcomes.

Based on the results of observations made at the SMA Frater Makassar that the teaching-learning process in this school is especially a chemistry lesson, most are still teacher centers, even though the learning process should be a student center. If learning continues like this of course learning objectives will not be achieved and student learning outcomes will be less good. The author conducted a study on students of class XI Science 1 because based on the data of learning outcomes of students in the subject matter of salt hydrolysis in the previous year reached completeness by 41%.

In this study, the authors chose salt hydrolysis material because this material is a combination of concepts and calculations, where students will be confused to solve problems related to material calculations, if they do not master the concept. Therefore, salt hydrolysis material is often considered difficult by students, so that students are lazy to learn it. By applying the TGT cooperative learning model, it will help students learn well. Even the material that combines concepts and calculations is very well used in the implementation of the tournament.
The results of the research conducted by Wijayanti [11] on Basic Physics learning by applying the cooperative type TGT model can increase conceptual understanding and the overall participation of students of science education. Another study conducted by Ahriani [12] concluded that the average learning outcomes of students taught with the cooperative learning model of the TGT type were higher than those taught with the STAD type cooperative learning model, while the research by Van Wyk [13] concluded the application of cooperative learning models TGT type is better than conventional models.

Based on the background above, now the author chooses to conduct research by applying the TGT cooperative learning model to see the effectiveness of chemical learning.

2. Methods

2.1. Research types
This study is a descriptive study that gives an idea of the effectiveness of the application of the TGT cooperative learning model to improve learning outcomes of students of class XI Science 1 SMA Frater Makassar.

2.2. Research variable
The variables that will be examined in this study are single variables, namely the effectiveness of the application of learning models that are measured by the learning outcomes of students. The effectiveness of learning intended is a measure that states the average completeness of each indicator achieved after the application of a learning model in the form of a percentage.

2.3. Research subject
The subjects of this study were students of class XI Science 1 SMA Frater Makassar with a total of 35 students. This class is the subject of research because in the previous year it had grade completeness of 41%.

2.4. Procedure

2.4.1. Preparation stage. The teacher prepares the material to be learned by making a plan for implementing learning, Making worksheets as a device in the TGT cooperative learning model

2.4.2. Implementation stage

| Meeting | Learning Activities |
|---------|---------------------|
| I       | Convey the goals to be achieved in the learning process  
Provide an explanation of the TGT type cooperative learning model  
Divide students into heterogeneous groups consisting of 5 people based on gender and cognitive abilities  
Carry out teaching about the characteristics of salts that can be hydrolyzed in water  
Sharing worksheets to students and directing them to discuss with group members  
The teacher oversees and guides students during discussions  
Discuss answers from each group |
| II      | Carry out the teaching about determining the nature of the salt hydrolyzed from the equation for the ionization reaction  
Sharing worksheets to students and directing them to discuss with group members  
The teacher oversees and guides students during discussions  
Discuss answers from each group |
| III     | Carry out teaching about calculating the pH of salts hydrolyzed in water |
Sharing worksheets to students and directing them to discuss with group members
The teacher oversees and guides students during discussions
Discuss answers from each group

IV
Carry out tournaments. Students will be divided into 5 tournament tables, where each
group sends one member to each tournament table. Each table shows the sequence of
learners' cognitive abilities in the group sorted from the tournament table 1 - 5. Then the
teacher shares tournament questions on each table, where the problem has different
difficulties between one table and another table based on students' cognitive abilities,
then participants students compete to solve the problem
Give individual values to the results of the tournament of each student
Gather individual values in each group and add them together to become group values
The teacher gives group awards for each tournament result

2.4.3. Final stage. Provide post-test to find out the learning outcomes of students

2.5. Data Collection Technique
Data about the description of student learning outcomes through tests taken from the post test results
in the form of objective tests in the form of multiple choices consisting of 5 choices of answers with a
number of 20 items that have been validated by 2 validators.

2.6. Data analysis technique
Data obtained in the form of scores on learning outcomes collected by using instruments in the form of
multiple choice questions, and analyzed using descriptive statistics. The formula used is the learning
effectiveness formula which is reviewed from each indicator. So first, the value of each student's
learning outcomes for each indicator is determined by dividing the scores achieved by students with
the ideal score from each indicator. Furthermore, the number of students who complete each of these
indicators is divided by the number of students as a whole to find out the percentage of completeness
in each indicator. The percentage of completeness of each indicator then divided by the number of
indicators shows the effectiveness of the implementation of the TGT cooperative learning model. The
description is presented in the following formula:
Complete individual learning every indicator

\[ T_p = \frac{X}{Sm} \times 100 \]

Information:
\( T_p \) = value of individual learning completeness
\( X \) = score of acquisition
\( Sm \) = maximum score for each indicator
The criteria for determining complete or incomplete students are > 65

| Value of Learning Completeness | Category |
|-------------------------------|----------|
| < 65                          | Not pass |
| ≥ 65                          | Pass     |

(Source: SMA Frater Makassar)

Percentage completeness of each indicator

\[ T_i = \frac{\sum T_p}{n} \times 100\% \]

Information:
\( T_i \) = complete percentage of each indicator
\( \sum T_p \) = the number of students who complete individual learning each indicator
\( n \) = total of students
Effectiveness of learning (completeness of all indicators)

\[ E_p = \frac{\Sigma T_i}{3} \]

Information:
\( E_p \) = effectiveness of learning
\( \Sigma T_i \) = complete number of each indicator

Percentage grade completeness

\[ T_k = \frac{\Sigma T_p}{n} \times 100\% \]

Information:
\( T_k \) = Percentage grade completeness

3. Result and discussion

3.1. Result

3.1.1 Data on tournament. Tournament results are obtained as follows:

| Group | Total Score | Predicate |
|-------|-------------|-----------|
| I     | 33.5        | Good team |
| II    | 34.5        | Good team |
| III   | 46          | Superteam |
| IV    | 32          | Good team |
| V     | 33          | Good team |
| VI    | 33.5        | Good team |
| VII   | 43          | Great team |

3.1.2 Description of students learning outcomes and the effectiveness of applying the type TGT of the cooperative learning model. The results of the descriptive analysis are obtained as follows:

| Statistics | Statistical score |
|------------|-------------------|
| Students total | 35 people        |
| Maximum score    | 100               |
| Highest score     | 95                |
| Lowest score      | 35                |
| Average score     | 75.57             |
| Standard deviation| 13.03             |

The value of learning outcomes of students of class XI Science 1 SMA Frater Makassar in terms of the average percentage completeness of each indicator as follows:

| Indicator | The average percentage of each indicator (Ti) |
|-----------|---------------------------------------------|
| 1         | 28.57%                                      |
| 2         | 97.14%                                      |
| 3         | 80%                                         |
| Total (\( \Sigma T_i \)) | 205.71%          |
The average percentage of each indicator is divided by the number of indicators tested so the learning effectiveness is obtained as follows:

\[
\text{Effectiveness (Ep)} = \frac{\sum_{i=1}^{3} \text{Ti} \times 205.71\%}{3} = 68.57\%
\]

3.2. Discussion

In table 4, it can be seen that there is only one team that has won the super team predicate, the team members have capabilities that are not too prominent in their daily lives, but they are all actively involved in learning and discussion so they can get the highest score. However, the value obtained by each team is not far adrift, this shows that really every student strives to the maximum to win the tournament.

In table 5, it can be seen that based on the results of descriptive data analysis of 35 students obtained a maximum value of 95, a minimum value of 35, and an average value of 75.57 from the learning outcomes of students. These results indicate that the difference between the highest and lowest values is very far, namely 60. Students who get the highest score are students who come from group VII (great team), he is actively involved in learning, diligent, and high daily values, while participants students who get the lowest score are students from group VI (good team), he is less active in learning, low daily values, and lazy (several times not present in learning). If viewed from the average score obtained is 75.57, it is seen that in general students are very happy with the TGT cooperative learning model so that their learning outcomes are high.

If viewed from the standard value of mastery learning in class XI Science 1 SMA Frater Makassar for the subject of salt hydrolysis that students who pass get a score of 65 and above as many as 31 people and those who do not pass get a value of <65 as many as 4 people, and completeness grade obtained 88.57%. This shows that there is an increase in student learning outcomes compared to the previous year in the same subject matter, wherein the previous year only had grade completeness of 41%. The number of students who were complete and incomplete had very far and unbalanced differences, this can be seen clearly in the following picture:

![Figure 1](image)

Figure 1. Different Pass and Not Pass

The difference between the pass and not pass very far because the average student gets high learning outcomes. The 4 students who did not complete were 4 students who came from groups that got the title of a good team. 3 of the students were not actively involved in learning and their daily low grades, 1 of them included students who were quite smart and active in learning, but who had low scores because the students were wrong in working on various questions that had almost the same answer choices. The first indicator is to determine the characteristics of several types of salt that can be hydrolyzed in water with a percentage of completeness of 28.57%. This indicator is a fairly easy indicator, but many students cannot answer the question because it is wrong by almost the same answer choices and moreover they are still difficult to determine which ions can be hydrolyzed in water.
The second indicator is determining the properties of hydrolyzed salts from the ionization reaction equation having a percentage of completeness of 97.14%. This indicator is the highest completeness indicator because students have enough mastery of salt hydrolysis reactions so that it is easier for them to know the nature of these salts.

The third indicator is calculating the pH of the hydrolyzed solution having a percentage of completeness of 80%. This indicator is a fairly difficult indicator, but students are able to do it because students have enough knowledge of the pH calculation formula and students are also happy in counting. However, in this indicator in question number 13, almost all students answered incorrectly because in their calculations the students only arrived at counting pOH and did not convert it to pH according to the request for the question.

The number of completeness percentages of each indicator divided by the number of indicators shows the effectiveness of the application of TGT type cooperative learning in students of class XI Science 1 SMA Frater Makassar in the subject matter of salt hydrolysis by 68.57%. This data shows that TGT type cooperative learning is good to be applied in learning.

4. Conclusion
The conclusions that can be obtained from the results of this study are based on the results of descriptive data analysis showing that the effectiveness of the implementation of the TGT cooperative learning model in students of class XI Science 1 SMA Frater Makassar in the subject matter of salt hydrolysis was 68.57%. The TGT cooperative learning model is well applied in learning because it can improve student learning outcomes.

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