Improving Students' Learning Outcomes Using The Team Based Learning Model With Multi-representation Approach On Electrolyte and Non Electrolyte Solutions

Masrid Pikoli[1]*, *Nurmeyla U.* Botuihe[1], and *Astin* Lukum[1]

1Department of Chemistry, Universitas Negeri Gorontalo, 96554 Bone Bolango, Indonesia

Abstract. This study aims to improve student learning outcomes on electrolyte and non-electrolyte solution materials of class X IPA 2 SMA Negeri 1 Suwawa using a Team-Based learning model with Multi-representation approach. This class action research by Kemmis and Taggart model which is carried out in the stages of planning, acting, observing, and reflecting. The research is conducted in two cycles by applying the Team-Based Learning model with a Multi-representation approach in each cycle. The finding shows that the Team-Based learning model with a multi-representation approach can improve students' learning outcomes in electrolyte and non-electrolyte solution materials. The improvement can be seen during the learning of cycle I and cycle II. Students' completeness is 62.9% in cycle I and 100% in cycle II. As well as having met ≥ 80% of success indicators. In addition, there is also an improvement in student activity and learning participation in electrolyte and non-electrolyte solution materials using a Team-Based learning model with a multi-representation approach. Student learning activity also improves with the average percentage of student activity at 90% in cycle I and 92.5% in cycle II with very good categories.

1 Introduction

Covid-19 which has been going on since the beginning of 2020 until now has had many impacts on various fields. One aspect that has been directly impacted by the COVID-19 pandemic is education. For example, learning that was previously carried out offline is temporarily limited until the pandemic condition ends. In order to maximize learning during the pandemic, the government issued an emergency curriculum policy by providing breadth for schools to use practical and efficient learning for distance learning. Referring to this policy, various educational institutions in Indonesia, including Gorontalo, launched a policy of learning from home using various platforms such as Google Classroom, Google meet and Zoom, as well as other platforms.

Using the platform is expected to limit the backwardness of students to finish the fundamental skills that have been previously decided. But in reality, numerous boundaries rise in conjunction with the implementation of online mastering. These barriers aren't simplest felt via faculties, but also by way of instructors and college students. Faculties have trouble accommodating instructors and students to keep mastering, in the meantime the issue of skilled instructors is that there are still many instructors who are not proficient in coaching the usage of online structures. On the other hand, college students are the parties who enjoy the maximum troubles while getting to know online. These obstacles are within the form of community inconsistencies, problems in having access to getting to know due to the fact there are not any verbal exchange gear, and the hassle of low scholar motivation to research.

Primarily based on the outcomes of the day by day take a look at the evaluation of class X at SMAN 1 Suwawa, the percentage of students' mastery in chemistry subjects tends to be low with classical completeness of 73.3%. Of the 30 participants, 22 participants completed and 8 students did not complete. This is influenced by several factors such as learning carried out during the pandemic only based on online and assignments, face-to-face learning that is carried out creates a learning atmosphere that is expected to be in the form of active interaction between teachers and students. Therefore, innovation is needed to solve these problems. One strategy that can be used is through classroom action research by implementing integrated Team Based Learning with the Multi-representation Approach. An innovative learning model that can overcome learning difficulties and is in accordance with the 2013 curriculum for Team-based Learning using multi-representation [1].

Team-Based Learning is a pedagogic model that uses groups of students to work together in teams to learn teaching materials. This model relies more on the interaction of many small groups than on other learning strategies [2]. Several research results show that: (1) Team Based Learning is more effective in improving learning outcomes compared to the lecture method [3] and (2) Team Based Learning can increase students' self-efficacy. In addition, overall that teachers (chemistry teachers) have understood that representation-based chemistry learning and with the identification of learning styles (multiple intelligences) is an effective and appropriate concept to produce a generation of teachers who are creative, innovative, competitive, competent, and competent. religious[4].

*Corresponding author: pikolimasrid@ung.ac.id

Team-Based Learning is described as a way that can be used to improve learning performance in an educational setting in the classroom. This is supported by various research results which show that the use of learning teams during the teaching and learning process is able to improve student learning outcomes, increase self-confidence, encourage critical thinking skills, encourage student interaction in study groups and provide relevance to subject matter in the field of study. The steps of the Team-based model can be seen in fig 1

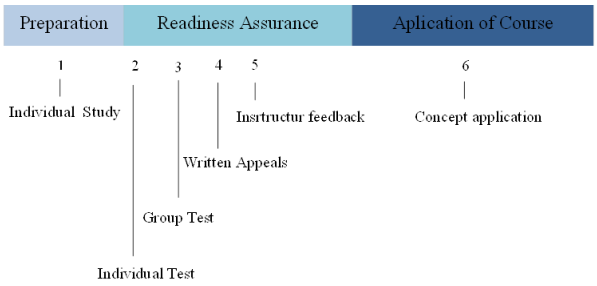

Fig. 1. Stages of Team-Based Learning [5]

Team Based Learning is described The explanation of the learning sequence of Team-Based Learning [6] is as follows:

1) Preparation.

Learners are given teaching materials that have been prepared with a multi-representation approach to be read at home or outside the classroom before starting the first meeting learning.

2) Readiness Assurance.

This stage has the following main components:

a) Individual Test/IRAT (Individual Readiness Assurance Test). The activities carried out at this stage are in the form of individual readiness tests (students) for the learning materials provided by the teacher in the previous stage. The form of the test can be in the form of a multiple choice test or an essay test which serves to measure the level of understanding of students towards the learning material.

b) Team Test/TRAT (Team Readiness Assurance Test). This test is carried out after students complete the previous IRAT test. At this stage, students discuss and make agreements regarding answers that are in accordance with the questions on the test.

c) Written Appeals. At this stage, students review teaching materials and ask questions that have not been understood, both related to questions on tests that have not been answered or material that has not been understood.

d) Instructor Feedback. At this stage, the teacher explains the problems experienced by students on the test IRAT and TRAT

3) Concept Application.

Students are given activities that are oriented towards understanding students' concepts in completing Student Worksheet that have been prepared with a Multi-representation approach carried out in groups.

The multi-representation approach is a form of representation that combines text, real images, or graphics [6][7]. Multi-representation learning is expected to be able to bridge the process of students' understanding of chemical concepts [8]. Multirepresentation is the practice of representing the same concept through various forms, which include descriptive (verbal, graphic, table) representation models, experimental, mathematical, figurative (pictorial, analogy and metaphor), kinesthetic, visual and operational actional modes. [4] [9]. Chemical phenomena can be explained by three different levels of representation, namely macroscopic, submicroscopic and symbolic. Each level of the chemical representation is shown in Fig. 2.

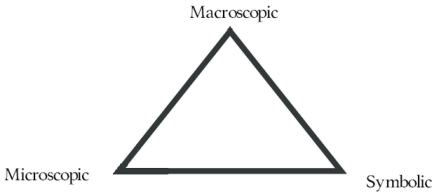

Fig. 2. Chemical Representation Level [10][11]

According to behavioristic theory, learning is defined as the result of the interaction between the stimulus given to the individual and the response to the stimulus [12]. Individuals are said to have learned if they have experienced changes in behavior [13] [14]. A person is considered to have discovered something if he can show a change in his behavior. In addition, a student studying results are described as capabilities that are acquired via individuals after wearing out the gaining knowledge of the process. The purpose of this learning process is for individuals or students to have permanent changes in behavior and experience[15]. Therefore, in every learning process, a teacher always sets learning goals so that individuals or students can be said to be successful in the learning process if they have achieved the learning objectives.

Learning is a fairly complex process. When carrying out learning a teacher is required to understand the various factors that can affect the learning outcomes of diverse students. In addition, learning outcomes are defined as overall changes in individual participants, both aspects of knowledge, aspects of attitudes, and aspects of skills[16]. That is, learning outcomes are comprehensive and inseparable from one aspect to another. Therefore, in this study, the observed learning outcomes are limited to cognitive aspects which include knowledge (C1), understanding (C2), application (C3), analysis (C4), assessing (C5) and creating (C6). Based on the description of the background above, researchers are interested in conducting research with the aim of improving student learning outcomes in the material of electrolyte and non-electrolyte solutions for class X IPA 2 SMA Negeri 1 Suwawa using the Team-Based Learning model with a Multirepresentation approach.

2 Method

This research was conducted in the even semester of the 2021-2022 academic year at SMAN 1 Suwawa, Suwawa

District, Bone Bolango Regency, Gorontalo Province. In accordance with the research objectives, the design used in this study is a Classroom Action Research (CAR) design which includes four stages of activity. [17], namely: (1) action planning (planning); (2) the implementation of the action (acting); (3) observation (observing); and (4) reflection (reflecting). This classroom action research follows the Kemmis and Taggart model which is carried out in the form of a cycle. The research was carried out in two cycles by applying the Team-Based Learning model with a Multi-representation approach in each cycle. Research design as shown in Fig. 3.

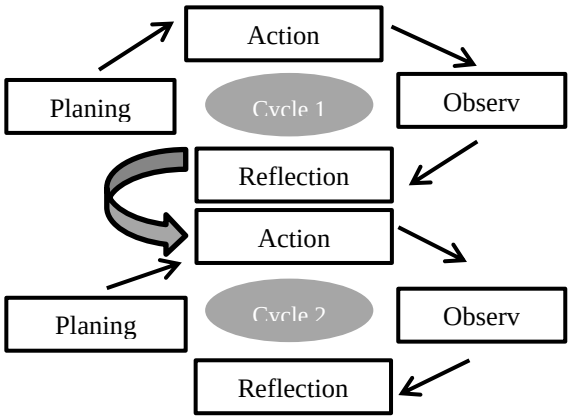

Fig. 3. Kemmis and Mc's Taggart Model Classroom Action Research [18].

Action and observation activities are combined at one time, namely when the action is carried out at the same time the observation is carried out. The researcher when taking action is assisted by the teacher who acts as an observer. The results of the observations are then reflected to plan the next stage of action. The action cycle is carried out continuously until the problem can be resolved and learning outcomes have increased. The subjects in this study were students of class X IPA2 SMAN 1 Suwawa, totaling 27 people.

The technique used in primary data collection in classroom action research in the form of observation sheets of teacher activities is used to see whether the steps taken in the learning process are in accordance with the material being taught. In the observation sheet, the teacher describes the learning steps that contain preliminary activities, core activities, closing activities during the learning process. Analysis of student activity sheets is carried out to find out how much active students are in following the learning process. The learning outcome test that will be used is in the form of a description test which is intended to determine the increase in student learning outcomes

Data analysis is one of the most important aspects of classroom action research. Data analysis is carried out in stages and continuously in each learning cycle. In this case, the data is in the form of the value of each student through the evaluation of student learning outcomes in the form of objective tests given at the end of each cycle and the activities of teachers and students. The criteria for the value of the results of observing the activities of observing student activities and the implementation of learning [19].

Table 1. Criteria for Student Activities and Teacher Activities

Value Range	Interpretation
86 % – 100 %	Very Good
76 % – 85 %	Well
66 % – 75 %	Enough
56 % – 65 %	Not enough
0 % – 55 %	Very Less

The value criteria for observing teacher activities and student activities are determined by referring to the assessment criteria

3 Result and Discussion

Cycle I was carried out in two meetings on the electrolyte and nonelectrolyte solution material with the indicator The learning process is as follows: (1) Identifying the properties of electrolyte and non-electrolyte solutions with three levels of chemical representation based on their electrical conductivity, (2) Analyzing the characteristics of electrolyte and non-electrolyte solutions with three levels of chemical representation based on experimental data, (3) Designing and or carrying out experiments to distinguish the electrical conductivity of solutions, (4) Identifying strong electrolyte solutions and weak electrolyte solutions with three levels of chemical representation, (5) Analyzing ionic compounds and covalent compounds forming electrolyte solutions with three levels of chemical representation (6) Designing and or implementing An investigation to distinguish strong electrolyte solutions and weak electrolytes based on their constituent compounds. Before learning using the Team-Based learning model with a multi-representation approach, the researcher first made various preparations and plans. The following is a general plan made by researchers with collaborators before carrying out the research, as follows:

1) Create a Learning Plan, conduct discussions to take basic competencies in accordance with the context of the Team-Based learning model with a multi-representation approach. This activity is carried out by researchers and in collaboration with teaching teachers.
2) Make the instruments used, namely observation sheets to observe student activities in the learning process and question sheets to measure the level of mastery of learning materials by students.

The instrument that has been made is then validated through content validity testing by a team of experts (expert judgment). The stages of implementing the action are in accordance with the stages in the Team-Based learning model with a multi-representation approach. From the data processing of the research results, it was found that the implementation of teacher activities in the first cycle was 78.23% with a good category. There are several aspects that are less than optimal, including: (1) the lack of apperception given at the start of learning, (2) the lack of emphasis on students regarding the importance of reading and understanding teaching materials, and (3) feedback and deepening of the material to students who have not been maximized. Through improvements and discussions with subject teachers in this case as observers, these deficiencies were then corrected in cycle II. This improvement showed

significant results, the implementation of teacher activities in the second cycle increased to 91.1% with a very good category. Improving the implementation of teacher activities can be seen in the following fig.

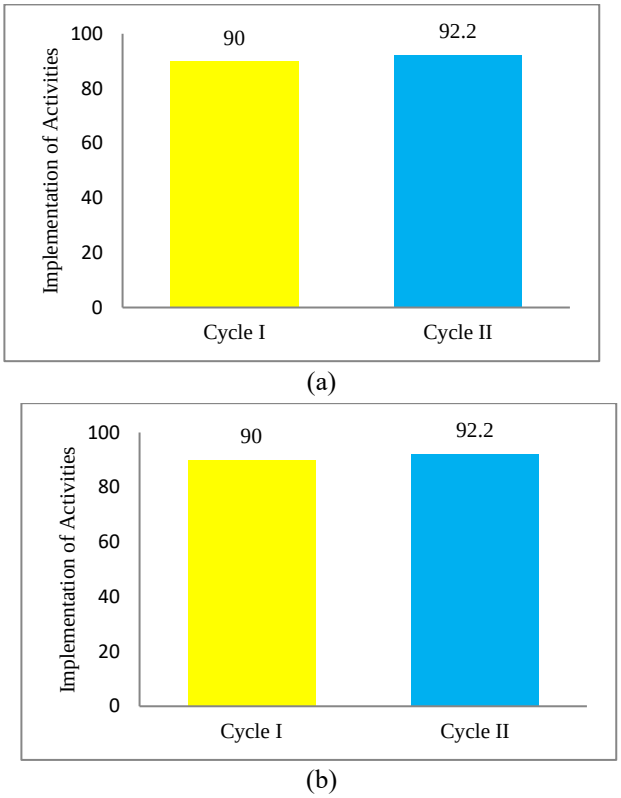

Fig. 4. Percentage of Activity Implementation in Cycle I and Cycle II (a) Teacher, (b) Students

Improvement of aspects that are lacking in cycle I, both aspects of teacher activities and student activities have a good impact on the interaction between teachers and students and students with students. Based on the data described above, it can be interpreted that the activities of teachers and students in this classroom action research have met the success indicator, which is greater than 80%Equations should be centred and should be numbered with the number on the right-hand side. The fulfillment in this school room movement research is an increase in student studying effects after being taught using team-based learning gaining knowledge of version with a multi-representation approach. Statistics for improving learning results is information received from the assessment consequences of every cycle. The information is received by giving a chain of questions that have been composed of a fabric that has been provided to students.

In this study, evaluation was carried out twice, the first at the end of the first cycle, the second at the end of the second cycle. Referring to the results of the data analysis of learning outcomes in the first cycle, the students' completeness was 62.96%. This value is still below the minimum completeness criteria, although the majority of students have achieved good results, there are some students' scores who get a score of less than 70. This is because students do not understand in depth the material being taught during the learning process because of feedback and the deepening of the material provided by the teacher has not been maximized. Referring to these results, the researchers made improvements in the implementation of the second cycle of learning, these improvements include the teacher emphasizing the importance of reading and understanding teaching materials, as well as providing feedback and deepening the material more often to students. This improvement gave significant results, the test of student learning outcomes in cycle II showed completeness of 100%. The score of students who were lacking in the first cycle was significant in the second cycle, but there were also some students who scored below 70 (KKM). However, in general, this completeness score has met the indicators of the success of classroom action research, namely the score obtained by students is 70 and the student's classical completeness score is greater than 80%. Improving student learning outcomes in cycles I and II more details can be seen in the following fig.

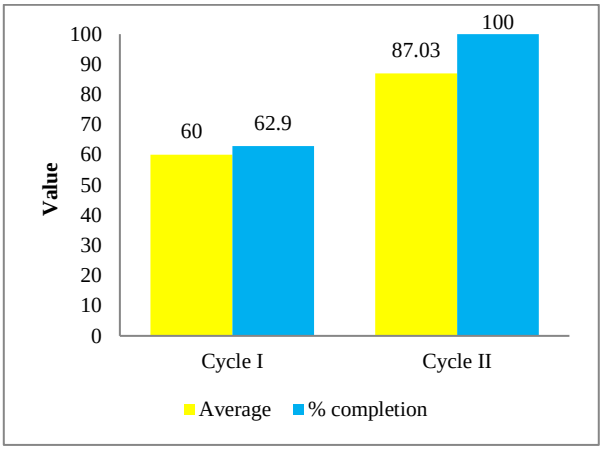

Fig. 5. Percentage of Learning Outcomes and Percentage of Students' Completeness in Cycle I and Cycle II

Getting-to-know effects inside the crew-based getting-to-know model with a multi-illustration method showed a substantial boom, this increase can be seen from the learning executed inside the first cycle to the second cycle. The second cycle of learning uses the crew-primarily based studying model with a multi-illustration technique to achieve the expected mastering results. The findings in this look are in step with numerous preceding research. [3] wrote that Team-Based Learning has an effect on increasing knowledge. Similar to this, [19] concluded that the Team-Based learning model with the Multiple Representation-based 6E multi-representation approach was able to improve students' critical thinking skills on acid-base material.

4 Conclusion

Primarily based on the effects of the actions which have been carried out in cycle I and cycle II, it can be concluded that the use of the team-based getting-to-know version with a multi-illustration approach improves scholarly mastering results on electrolyte and non-electrolyte solution materials.

This growth may be visible during gaining knowledge of cycle I and cycle II. The boom in getting-to-know outcomes turned into 62.9% entire inside the first cycle to one hundred% complete within the 2nd cycle. And has met 80% of achievement signs. Further, there's a boom in pupil mastering activity and participation in electrolyte and non-electrolyte answers with the use of the group-primarily based studying model with a multi-representation approach. Expanded student mastering interest with a median percentage of student activity fulfillment of 90% in the first cycle and 92.5% in the second cycle with a superb class.

5 Acknowledgment

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