Effect of Chemistry Triangle Oriented Learning Media on Cooperative, Individual and Conventional Method on Chemistry Learning Result

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Abstract. The purpose of this study was to see which method are well used with the Chemistry Triangle-oriented learning media. This quasi experimental research involves first grade of senior high school students in six schools namely each two SMA N in Solok city, in Pasaman and two SMKN in Pariaman. The sampling technique was done by Cluster Random Sampling. Data were collected by test and analyzed by one-way anova and Kruskall Wallish test. The results showed that the high school students in Solok learning taught by cooperative method is better than the results of student learning taught by conventional and Individual methods, both for students who have high initial ability and low-ability. Research in SMK showed that the overall student learning outcomes taught by conventional method is better than the student learning outcomes taught by cooperative and individual methods. Student learning outcomes that have high initial ability taught by individual method is better than student learning outcomes that are taught by cooperative method and for students who have low initial ability, there is no difference in student learning outcomes taught by cooperative, individual and conventional methods. Learning in high school in Pasaman showed no significant difference in learning outcomes of the three methods undertaken.

1. Introduction
Learning is the process of communication between teachers, learners, and learning resources " . Learning media is one that can be used to convey a message, stimulate the mind, feelings, attention, and willingness of students so as to encourage the learning process. Leive and Lentz in Sanaky (2009: 6-7) said that "four functions of instructional media especially on visual media that is attention function, affective function, cognitive function and compensatory function.

Learning can be effective when all components that play a role in the learning process support each other in order to achieve the goal. One of the most influential components in today's learning is the use and selection of appropriate instructional media in order to improve students' skills. According to Sadiman et al (2006: 17) the appropriate use of media can overcome the passive attitude of students, thus causing excitement of students in learning.

Each individual has different levels of ability and background of experience. Different levels of ability possessed by each individual sometimes make it difficult to cooperate with others in the group; because that is the case that individual activities are effective. Each individual has a different type or learning style. Individual learning activities can be intensified according to individual learning styles. In individual learning students are required to be able to learn independent. The positive side of the use of individual
learning is the awakening of student self-confidence. Students become independent in carrying out the learning, and students do not have dependence on others dently, without any cooperation with others.

In addition, individual learning, cooperative / group learning is a learning that can and often is used by educators. This learning comes from the concept that students will more easily find and understand difficult concepts if they are discussing with their friends. Cooperative learning can cause psychological elements of students to become aroused and become more active. Theoretically this is caused by a sense of togetherness in a group, so that students can easily communicate with a more simple language. During discussion the memory function of the students will become more active, more enthusiastic and courageous to express an opinion.

The conventional approach is a learning approach that is very often done in schools. The conventional approach that is meant here was a learning approach that is more teacher centered, done by combining learning methods of lectures and question and answer. The source of learning in conventional learning more in the form of verbal information obtained from the book / explanation of teachers (2007: 294) says that the concepts in chemistry are studied in three levels of representation, namely macroscopic, submicroscopic (molecular) and symbolic. These three levels of representation are also known as the Chemistry Triangle. Macroscopic representation is a representation that describes most of the nature of real phenomena and is seen in the experience of everyday students. A submicroscopic representation (molecular) is an explanation of phenomena at the particle level (atom, molecule or ion). Symbolic representation (symbol) is a representation using chemical symbols, formulas, equations, models and computer animations to symbolize substances. These three levels of representation are interrelated and an important character in chemistry learning. To develop students' understanding of chemistry, learning should guide students using and linking these three levels of representation (Wu, Krajcik and Soloway, 2001: 822). For that purpose, the learning media has been oriented by Chemistry Triangle in the form of multimedia that integrates animation, voice and text demonstration video to convey macroscopic, submicroscopic and symbolic chemical concepts for high school students. In the making, this learning media has been through several stages of the test validity, practicality and effectiveness. This medium has also been trialed in a limited number of schools, then the media is perfected in accordance with the validator's suggestions. Learning media that have been made is then experimented on several schools in West Sumatra.

Based on the above description has been conducted research on the use of media-oriented Chemistry Triangle on cooperative, individual and conventional learning. This study aims to determine what method is suitable to be used with learning media oriented Chemistry Triangle.

2. Method

To determine the class and the school to be sampled, cluster random sampling technique is used. The results obtained as a sample in this study are 2 SMA in Pasaman District, 2 SMAN in Solok city and 2 SMK in Paraiaman city. Each school is drawn 3 classes each of which is taught by cooperative, individual and conventional learning methods using the Chemistry Triangle-oriented learning media. The level of student ability is used as a moderator variable. To obtain student learning result data used objective test given at the end of learning. Before the test, the test is tested first and analyzed to get a good question. The hypotheses to be tested in this study were:

- There are differences in student learning outcomes that learn by cooperative, individual and conventional methods using Chemistry Triangle oriented learning media
- There are differences in student learning outcomes with high ability to learn by cooperative, individual and conventional methods using Chemistry Triangle oriented learning media.
- There are differences in student learning outcomes with low ability to learn by cooperative, individual and conventional methods using Chemistry Triangle oriented learning media.

Data analysis for hypothesis test was done by Anava or Kruskal Wallisch technique. This experimental study used the following research design.
Table 1. Research Design

| students ability (A) | learning methods (B) | cooperative learning (B1) | individual learning (B2) | conventional learning (B3) |
|----------------------|----------------------|---------------------------|--------------------------|---------------------------|
| Higher ability (A1)  | A1B1                 | A1B2                      | A1B3                     |
| Low ability (A2)     | A2B1                 | A2B2                      | A3B3                     |

3. Results and Discussion

3.1. Result

3.1.1. The results of high school students in Pasaman district. Prior to hypothesis testing, the first test needs analysis. Based on the results of the analysis requirements test, hypotheses 1, 2, and 3, are tested by Kruskal-Wallish Test with SPSS processing because the data was not normal but homogeneous.

Table 2. First Hypothesis Test for SMA Pasaman district

|                | cooperative | Individual | conventional |
|----------------|-------------|------------|--------------|
| number of samples | 74          | 74         | 74           |
| mean            | 80.824      | 78.081     | 79.621       |
| Total rank      | 8076        | 8310       | 8367         |
| Quadrate rank   | 65221776    | 69056100   | 70006689     |
| H count         | 16,187      | 16,188     | 16,187       |
| Chi table       | 27,59       | 27,59      | 27,59        |

Based on Table 2 it can be seen that H arithmetic is smaller than chi table, meaning H1 is rejected and H0 is diterima. It can be concluded that there is no significant difference in student learning outcomes studied by cooperative, individual, and conventional methods using Chemistry Triangle-oriented learning media. However, it can be seen that the learning outcomes of cooperative group students is highest compared to the other two groups.

Table 3. Second and Third Hypothesis Test for SMA Pasaman

|                | High ability | Low ability |
|----------------|--------------|-------------|
| number of samples | 18           | 18          | 18           |
| Mean            | 83,187       | 83.5        | 79.93        | 77,625       | 73,715       | 78,222       |
| SD              | 11,4789      | 83.485      | 14,0939      | 12,98        | 21,86        | 12,94        |
| Varian          | 131,7625     | 70.3        | 198,638      | 168,55       | 478,22       | 167,59       |
| H count         | 13,38        | 3.69        | 28.3         |              |              |
| chi             | 28.3         | 28.3        |              |              |              |

From Table 3 it can be seen that for students with high or low ability, H count is also smaller than chi table, so it is concluded that there is no difference in student learning outcomes with high ability in all three groups, as well as low-ability students. In low-ability students, conventional group learning outcomes were better than the other two groups.

3.1.2. Student’s learning outcomes in Kota Solok. Test requirements for learning outcomes in Solok city show that the data is homogeneous and normal. Hypothesis test is done with two-ways Anava

Table 4. First Hypothesis Test for SMA Kota Solok

|                | cooperative | individual | conventional |
|----------------|-------------|------------|--------------|
|                |             |            |              |

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In testing the first hypothesis, F count is greater than F table, then the null hypothesis is rejected. In other words there are differences in student learning outcomes taught with media oriented chemistry triangle on learning with cooperative, individual and conventional methods. To determine which method gives a difference in student learning outcomes, it is necessary to calculate Tukey's HSD. Based on the conclusions of the average difference table between groups in the Tukey "s HSD test, it can be seen that the cooperative group did not differ significantly with the conventional group. The individual group learning outcomes did not differ significantly with the conventional group and the cooperative group learning outcomes differed significantly individual groups. It turns out that the average of cooperative group learning outcomes is highest compared to the other two groups, and the individual group learning outcomes are lowest.

Test of Second and third Hypotheses

The second and third hypotheses test aims to see the difference in the average of high learning achievement of the first high-ability students (hypothesis 2) and low initial students. The result of test requirement shows that the data is not normal then used non parametric statistical test that is Kruskall-Wallish test.

| Table 5. Test of second and third Hypotheses for SMA in Solok City |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|                                | High ability    | Low ability     |
|                                | Kooperatif      | individual     | konvensional    | Kooperatif      | Individual      | Konvensional    |
| number of samples              | 16              | 17              | 17              | 16              | 17              | 17              |
| Mean                           | 88,4375         | 80,2941         | 85,29412        | 50,88235        | 42,05882        | 45,58824        |
| SD                             | 4,36606         | 5,72019         | 5,144958        | 9,552588        | 9,363964        | 9,165553        |
| Varian                         | 19,0625         | 32,7205         | 26,47059        | 91,36029        | 87,68382        | 84,00735        |
| H count                        | 12,5192         |                 |                 |                 |                 |                 |
| chi                            | 5,9915          |                 |                 |                 |                 |                 |

Based on Table 5 it can be seen that the price of H> chi, either for high or low initial students. If the value of H and chi with the acceptance criteria H0, then H0 is accepted if the price of H is smaller than chi while for the other value H0 is rejected. The value of chi obtained outside the acceptance criteria H0 means that H0 is rejected and H1 accepted means that there is a significant difference in the average of student learning outcomes to the three groups. Based on the conclusions of the mean differences between groups in the Tukey "s HSD test, it is known that for students with high initial ability the learning outcomes of the cooperative group differed from the individual group but did not differ significantly with the conventional group. The conventional group is significantly different from the individual group.

For students with low initial ability, cooperative group learning outcomes differ significantly with conventional and individual groups. Individual group learning outcomes did not differ significantly with conventional groups.

3.1.3. Students Learning Outcomes in Pariaman City. Test requirements for learning outcomes in Pariaman City also show that the data is homogeneous and normal. Hypothesis test is done with Anava 2 direction.
Table 6. First Hypothesis Test

|                     | cooperative | individual | conventional |
|---------------------|-------------|------------|--------------|
| Number of sample    | 58          | 54         | 59           |
| Mean                | 61,983      | 65,741     | 67,542       |
| SD                  | 11,620      | 12,863     | 11,904       |
| Varian              | 135,034     | 165,478    | 141,701      |
| F count             | 6.38        |            |              |
| F table             | 3.06        |            |              |

Based on the conclusion of Tukey's HSD test, it can be seen that student learning outcomes in groups of students who learn by cooperative method is not different from student learning outcomes in groups of students taught by individual methods. Students' learning outcomes in groups that were studied by individual methods did not differ from student learning outcomes in groups of students studying by conventional methods. Students' learning outcomes in the group studying with cooperative method differed significantly with student learning outcomes in the group of students studying by conventional methods. The learning outcomes of the students who studied with the conventional method were highest compared to the other two groups who studied with cooperative and individual methods.

Table 7. Second and Third Hypotheses test

|                     | Higherer ability | Low ability |
|---------------------|------------------|-------------|
|                     | cooperative      | individual  | conventional |
| Number of sample    | 16               | 14          | 15           |
| Mean                | 73,75            | 80,357      | 79,33        |
| SD                  | 7,853            | 6,064       | 7,761        |
| Varian              | 61,677           | 44,093      | 60,238       |
| F count             | 3,484            |             | 2,128        |
| F table             | 3,22             |             | 3,22         |

Based on the calculation in Table 7 by using one way anova test at significance level $\alpha = 0.05$, for students with high ability obtained $F$ count 3.484 while $F$ table = 3.22. This result shows that $F$ calculated > $F$ table so that H0 is rejected and H1 accepted. Means there are differences in student learning outcomes that have high ability by using cooperative, individual and conventional learning methods. Determination of which method provides different learning outcomes for groups of students with high initial ability, was tested further using Tukey's HSD test.

Based on the conclusion of Tukey's HSD calculation, it can be seen in groups of students with high initial ability there are differences in student learning outcomes between groups of students taught by cooperative methods with groups of students taught by individual methods. In groups of students with high initial ability there are differences in student learning outcomes between groups of students taught by cooperative and conventional methods. Learning by individual and conventional methods in high ability group students no significant differences in learning outcomes.

Anova test for low-ability students, obtained the price of $F$ arithmetic 2,128 while $F$ table = 3.22. This result shows that $F$ calculated < $F$ table so that H0 is accepted and H1 is rejected. This means there is no difference in student learning outcomes that learn by cooperative, individual and conventional methods using learning media Chemistry triangle.

3.2. Discussion
The results of the study in Pariaman city suggest that overall learning outcomes, the best conventional methods, differ significantly with cooperative methods, but do not differ significantly with individual...
methods. Student learning outcomes with higher capabilities of individual methods are better, significantly different from cooperative methods, but not significantly different from conventional methods. Conventional method was best for students who have low ability. Individual methods are better than cooperative methods, but do not differ significantly.

In contrast to previous studies, in this study, student learning outcomes in the cooperative class did not give better results than the conventional class. This is because students are not used to study cooperatively, the discussion does not go smoothly. Individuality is more visible during group discussion, meaning that there is no good cooperation, interaction between group members has not been optimal. In the conventional method, teachers themselves who explained the media, so it makes students easier to understand. Learning becomes directed and controlled and the allocation of time has been determined sufficient for the learning process.

The results of the study in Solok City showed that individual classroom learning outcomes did not differ significantly with the conventional group and the cooperative group learning outcomes differed significantly with the individual group, but did not differ significantly with the conventional class. It turns out that the average of cooperative group learning outcomes is highest compared to the other two groups, and the individual group learning outcomes are lowest. Based on the conclusions of the mean differences between groups in the Tukey’s HSD test, it is known that for students with high initial ability the learning outcomes of the cooperative group differed from the individual group but did not differ significantly with the conventional group. The conventional group is significantly different from the individual group. For students with low initial ability, cooperative group learning outcomes were higher, significantly different from the conventional and individual groups. Individual group learning outcomes did not differ significantly with conventional groups. The high learning outcomes of cooperative classes can be attributed to the fact that they are accustomed to learning by cooperative methods. They are able to cooperate well, the discussion went smoothly.

When viewed from the learning outcomes in Pasaman district, there is no significant difference in the learning outcomes of students who are learning with the three learning methods, either overall, as well as in students with high and low ability. In Pasaman district, students are accustomed to learning by conventional method, but do not show better learning outcomes than cooperative and individual methods.

The purpose of this study is mainly to find out which method is better done for chemistry-oriented media triangle. In this study conducted learning with cooperative, individual and conventional methods. The results of previous studies relating to cooperative learning generally suggest that cooperative learning is better than conventional learning. Apparently not always learning with cooperative method gives better learning outcomes than conventional methods. The results of the study in Pariaman showed that conventional methods gave higher learning outcomes (significantly different) with the other two groups. The learning outcomes at Pasaman showed no significant differences between the three groups. Only in the city of Solok gives better results to classes that learn by cooperative methods.

When viewed from the three areas where the research, it turns out the learning outcomes of students who learn by conventional methods do not differ significantly with students who learn with cooperative methods. Even in Pariaman, conventional methods show the best learning outcomes compared to the other two methods. This shows that none of the methods are good for all students. Each method has its own advantages and disadvantages. In addition, each student also has different learning styles and intelligence. There are students who like to study groups, some who like to study independently. The results also show that students with low ability, learning with conventional methods provide better learning outcomes. Different levels of ability possessed by each individual sometimes make it difficult to work with others in groups, so cooperative learning methods do not provide better learning outcomes.

In learning with individual methods, students are required to be able to learn independently. It is expected that with this individual method students with high ability will get higher learning outcomes. It turns out that only in Pariaman the result of learning by individual method gives better learning result which is significantly different with the other two methods. Teacher skills in managing learning methods will also provide different student learning outcomes. Not all teachers are able to manage cooperative
learning well. Each teacher has different professional competencies, some are more skilled at managing cooperative learning, some are happy with conventional methods and others.

4. Conclusion
The three methods were used, none of the methods are good for all students. In the sample schools in Pasaman district, there was no significant difference in the mean of student learning outcomes that were taught by cooperative, individual and conventional methods. In Solok city, cooperative learning provides better student learning outcomes than the other two methods and in Pariaman the conventional method provides the best learning outcomes compared to cooperative and individual methods. In Pasaman and Pariaman districts, students with high initial ability, individual methods provide the best learning outcomes. Students with low initial ability, conventional methods provide better results. It can be concluded that many things affect learning outcomes, not just learning methods. Student learning styles, characteristics, learning motivation will affect learning outcomes. Teaching style of teachers and the ability of teachers in managing the learning process also greatly affect the learning outcomes.

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