The colloid labyrinth media to improve students motivation and learning achievement on chemistry lessons

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Abstract: The colloid labyrinth media is a game media that can be used in learning chemistry topics taught in high school. The type of this research was experiment research with design randomized control group pretest-posttest design. This research object is students of SMA 8 Pekanbaru. The sample of this research consisted of 32 students of XI IPA 9 as the experiment group and 35 students of XI IPA 10 as the control group at the 2016/2017 academic year which were determined randomly after conducting normality and homogeneity test. The experiment class was treated with the use of labyrinth media while the control class without the use of labyrinth media. The data analysis was using the analysis of descriptive statistic and t-test. Based on analysis of the data obtained fcount > ftable is 2.63 > 1.67, it’s mean that the use of labyrinth media can improve students learning outcomes on the subject of colloid in XI IPA SMA Negeri 8 Pekanbaru. Based on the data analysis, it is obtained students motivation in experiment groups (66.14%) than control group (40.95%), means that the use of labyrinth media can improve students motivation on the subject of colloid in XI IPA SMA Negeri 8 Pekanbaru. The category improvement of students learning achievement at experiment group was high category with N-gain normalized is 0.8633.

1. Introduction

Education is an important aspect in life that can improve the quality of human resources. Quality education can be obtained from quality learning process. The learning process is the most important activity in the process. The success or failure of learning goals depends on what the students do [1]. The teaching and learning process between teachers and students as students will have a good weight by itself when there is good communication between the two, in this case the transfer of knowledge to students [2]. Conclusion from [3] suggests that in the learning process teachers should create an atmosphere in such a way that learners are motivated to be active in the learning process.

Donald in [4] suggest that motivation is a change of energy in a person's person that characterized by the emergence of affective (feeling) and reaction to achieve the goal. In other words, motivation is a psychological condition that drives someone to do something. While the learning motivation is a psychological condition that encourages a person to learn [4]. The learning motivation give direction and activities to be done in accordance with the purpose of learning on the subject matter [5]. All subjects require an understanding of the matter contained therein. One of the subjects given in senior high school which is a branch of the field of natural science, that is chemistry lesson.

Chemistry as part of the natural sciences is acquired and developed on the basis of experiments to seek answers of the question of what, why, and how about natural phenomena particularly related to the composition, structure, nature, transformation, dynamics and energetics of matter. In addition to the role to understand the various natural phenomena, chemistry is also very helpful and contribute to the mastery of other science, such as basic science, such as biology, and applied science such as agriculture, health. One of the chemistry subject that studied in class XI IPA is colloid. The subject of colloid is the
subject of theory and analysis, so it takes a high understanding in answering questions related to the subject.

Based on interview with one of chemistry teacher in class XI SMA Negeri 8 Pekanbaru, the average of student test on colloid subject is 84.62 and already fulfill the mastery of learning outcomes (MLO) determined by school for colloid subject is 83. The value of these learners has reached the MLO, but the learning in classroom is still monotonous and unpleasant. It is seen that only a few students are motivated in learning. During the learning process, some students tend to pay less attention to what the teacher is saying because students feel already understood in the matter, let alone many of the students have learned from tutoring, so they are less motivated to repeat the lessons they have learned in tutoring. Some students are also bored in learning that just doing the task, frequently asked questions as is usually done. One effort that is expected to overcome the above problem is use the labyrinth learning media.

The labyrinth or maze is a place full of twisting and twisting roads and corridors and separated by walls. Labyrinths are often made a challenge in the game, where there is an object in the starting position (matter) must find a way out at a given position (answer matter) [6]. This labyrinth media is helpful in correcting misperformed students understanding without the teacher directly notifying, but the students themselves who seek out and also reinforce the understanding of students who already understand to be more understandings again [7]. With this media, learning is expected to attract more student motivation. In addition, enabling learners to learn and practice with a fun atmosphere without leaving the goal of learning so that students do not feel bored to follow the learning process.

Research with the development of labyrinth media has been implemented, among others: [8] conducted research on "development of labyrinth game to help children’s motor development” showed that 80% maze game can be used as learning media.

2. Method
The data was collected from: (1) The initial data value for the homogeneity test was used as the data to select the experiment and control group, (2) the pre-test was performed in both group before entering colloid subjects and before being treated, (3) post-test given both group after completion of colloid subjects and the entire treatment process is given, (4) the questionnaire of learning motivation. Data analysis technique used are descriptive statistical analysis and t-test.

The research design is Pretest-Posttest Design Randomized Control Group can be seen in Table 1 [9].

| Group | Pre-test | Treatment | Post-test |
|-------|----------|-----------|-----------|
| Experiment | T₀ | X | T₁ |
| Control | T₀ | - | T₁ |

When:
T₀ : Initial data (data before treatment), taken from pre-test value
X : Treatment of learning is the media labyrinth on colloid subjects
T₁ : The final data (data after treatment), is obtained from the post-test value

Both samples are said to have the same or homogeneous variance if \( F_{\text{count}} < F_{\text{table}} \), where \( F_{\text{table}} \) is obtained from the distribution of \( F \) with probability \( \alpha \), where \( (\alpha = 0.05) \) and \( d_k = (n_1 - 1, n_2 - 2) \). Hypothesis test is done by using the right-t test with the formula as follows:

\[
t = \frac{\bar{x}_1 - \bar{x}_2}{S_g \sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}
\]

The combined standard deviation can be calculated using the following formula:
$$S_g^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

The hypothesis is accepted if $t_{\text{count}} > t_{\text{table}}$ with probability criterion $1 - \alpha$ ($\alpha = 0.05$ and $d_k = n_1 + n_2 - 2$), for the other price $t$, the hypothesis is rejected. The category of students learning achievement using ($N$ - gain) [10].

Table 2. N - gain Normalized and Category values.

| N-gain Average is normalized | Category |
|-------------------------------|----------|
| $N$ - gain $\geq 0.70$       | High     |
| $0.30 \leq N$ - gain $< 0.70$| Medium   |
| $N$ - gain $< 0.30$          | Low      |

3. Results and Discussion

3.1. Motivation of learners on the subject of colloid by using the labyrinth media

This study was conducted to determine the motivation of learners on the subject of colloid by using the labyrinth media in the experiment class (XI IPA 9) and without using the labyrinth media in the control class (XI IPA 10). This research only came to descriptive data analysis because in this research did not see improvement of students motivation but only to know what percentage of student motivation in experiment and control class.

Based on the data obtained from the questionnaire score, it appears that there is an improve in learning motivation, amounting to 21 students from 32 students. The result of data analysis of students learning motivation level for each indicator can be seen in Table 3 and 4.

Table 3. Percentage of Students on the Learning Motivation of Each Experiment Class Indicator.

| Indicator Number | Statement Number of Questionnaire | Students Percentage (%) | E  | D  | C  | B  | A  |
|------------------|----------------------------------|-------------------------|----|----|----|----|----|
| 1                | 1,2,3,11                         |                         | 2  | 5  | (6.25) | (15.63) | (78.13) |
| 2                | 5,6,9,12                         |                         | 1  | 7  | (3.13) | (21.88) | (75)   |
| 3                | 4,7,8                            |                         | 1  | 10 | (3.13) | (31.25) | (65.63) |
| 4                | 10                               |                         | 1  | 13 | (3.13) | (40.63) | (56.25) |
| 5                | 13,14                            |                         | 1  | 12 | (3.13) | (37.5)  | (59.38) |
| 6                | 15                               |                         | 1  | 11 | (3.13) | (34.38) | (62.5)  |

When, A : Very high category
B : High category
C : Medium category
D : Low category
E : Very low category
Table 4. Percentage of Students on the Learning Motivation of Each Control Class Indicator.

| Indicator Number | Statement Number of Questionnaire | Students Percentage (%) | E       | D       | C       | B       | A       |
|------------------|----------------------------------|--------------------------|---------|---------|---------|---------|---------|
| 1                | 1,2,3,11                         |                          | 2       | 11      | 22      |         |         |
|                  |                                  |                          | (5.71)  | (31.43) | (62.86) |         |         |
| 2                | 5,6,9,12                         |                          | 1       | 24      | 10      |         |         |
|                  |                                  |                          | (2.86)  | (68.57) | (28.57) |         |         |
| 3                | 4,7,8                            |                          | 10      | 19      | 6       |         |         |
|                  |                                  |                          | (28.57) | (54.29) | (17.14) |         |         |
| 4                | 10                               |                          | 1       | 24      | 10      |         |         |
|                  |                                  |                          | (2.86)  | (68.57) | (28.57) |         |         |
| 5                | 13,14                            |                          | 1       | 17      | 17      |         |         |
|                  |                                  |                          | (2.86)  | (48.57) | (48.57) |         |         |
| 6                | 15                               |                          |         |         |         |         |         |
|                  |                                  |                          |         |         |         |         | (40)    |
|                  |                                  |                          |         |         |         |         | (60)    |

Table 5. Percentage (%) of Students Motivation.

| Class     | Motivation Category | Very High | High | Medium | Low | Very Low |
|-----------|---------------------|-----------|------|--------|-----|----------|
| Experiment|                     | 66.14     | 30.21| 3.65   | -   | -        |
| Control   |                     | 40.95     | 51.905| 8.572  | -   | -        |

Based on result on Table 5, it can be seen that the percentage of students motivation in experiment group (66.14%) is higher than control group (40.95%) in very high category [11]. This is due to the experiment class used in the labyrinth media, while the control class without the media labyrinth. The data used to test the hypothesis in this study is the difference between the value of pretest and posttest.

In Table 6 shows that the value of $t_{count}$ was greater than $t_{table}$, 2.63 $>$ 1.67 means that the use of labyrinth media can improve students achievement on the subject of colloid in XI IPA SMA Negeri 8 Pekanbaru. The category improvement of students achievement at experiment class was high category with N-gain normalized is 0.8633.

Table 6. t-test Results.

| Class     | N   | $\sum X$ | $\sum X^2$ | $\bar{X}$ | The combined standard deviation | $t_{table}$ | $t_{count}$ |
|-----------|-----|----------|------------|-----------|-------------------------------|-------------|-------------|
| Experiment| 32  | 1452.5   | 69443.8    | 45.391    | 10.824                        | 1.67        | 2.63        |
| Control   | 35  | 1345     | 55787.5    | 38.429    |                               |             |             |

The result of descriptive statistical analysis shows that the percentage of students motivation in experiment group (66.14%) is higher than control group (40.95%) in very high category [11] because students in experiment class use labyrinth media on colloid subject. Before beginning the use of the labyrinth media, the teacher has told the students that they are done Student activity sheets (SAS), there will be quizzes and quizzes answered by using the labyrinth media. From there the students have been seen happy and enthusiastic to quickly complete his SAS in order to immediately use the media labyrinth. The parameters used to determine the speed in the use of this maze media is time. The use of this labyrinth media makes the growth of competitiveness or competition from students to solve the
problems given in order to succeed quickly [12]. This is in line with what [13] says that a healthy atmosphere of competition among students gives students the chance to measure themselves through the abilities of others. Students are very challenged to know the path that matches the answer. If the student does not know the answer, the student can ask for help from a group friend. On the use of this medium train students in working together and honestly. Honest in doing the quiz without looking at the book and being honest in terms of time because the teacher sees the students speed in answering from the time calculated by his own group. The media labyrinth is shaped like a game, so the lesson more attracts students and students more easily remember it. This is in accordance with the submitted by [8] that the ability of the media to attract the attention of the child in recognizing a thing and also can improve the memory so that students can store the subject matter in a longer time compared with conventional teaching methods.

3.2. Learning motivation has a relationship with student achievement

If the individual has a high learning motivation, then the individual will reach a good achievement [4]. If students are more motivated to learn, then the resulting achievement is higher [14], [11]. A person who has high achievement motivation tends to try to complete the task completely without delaying the job [15]. The completion of such tasks is not an external push, but a personal effort [13].

After the learning process has finished, the two classes are tested again using the same test as the pretest (posttest). Posttest data obtained from both classes were tested for normality. The normality analysis results of experiment class and control class have $L_{max} \leq L_{table}$. It can be concluded that the two classes are normally distributed. The average value of experiment class posttest is higher than control class that was 90.313 and 84.643, indicates that learning by using labyrinth media on colloid subject can improve students learning achievement.

The influence of the use of labyrinth media on colloid subject can be known by analyzing the difference of pretest and posttest values. The calculation result of difference of pretest and posttest data got $t_{count} = 2.63$ dan $t_{table} = 1.67$. This shows that $t_{count} > t_{table}$ which means the use of labyrinth media on the subject of colloid can improve students learning achievement on colloid subject. The the normalized gain (N-Gain) of the students learning outcomes in the experiment class was 0.8633 which belongs to high category, while for the control class was 0.8302 which belongs to high category [10].

![Figure 1](image_url)

**Figure 1.** The Chart of Average Evaluation Value of Experiment Class and Control Class.

Figure 1. Showed that the average value of student at each meeting. From the graph it is seen that almost at each meeting in the experiment class is higher the average percentage of evaluation value than the control class. This is because prior to the evaluation, students are given a quiz by using the media labyrinth. This media can be used as a measure of understanding of students about the colloid system. Students are more motivated to work on the quiz because there are interesting things that students will
do after getting the answer, which is looking for directions to prove the answer is true or false by using the media labyrinth. Students will more easily remember the lesson because the student is directly involved in validating the quiz answer. When the teacher gives an evaluation question, students can do it and get a satisfactory score.

Learning achievement is not only seen in terms of cognitive only but also includes affective and psychomotor aspects. The higher the students learning motivation, the more achievement they will get [16]. One characteristic of high student motivation can be seen from the value of affective and psychomotor [17].

The affective and psychomotor assessment of students in experiment class and control class can be seen in Figure 2 and 3.

![Figure 2. The Chart of Affective Assessment of Experiment and Control Class.](image1)

![Figure 3. The Chart of Psychomotor Assessment of Experiment and Control Class.](image2)

Figure 2 and 3 showed that the amount of students who have affective and psychomotor values. Assessment of affectives that include honest, curiosity and collaboration shown by students through the use of labyrinth media on colloid subjects each meeting is higher than students without the media labyrinth. Assessment of psychomotors covering various aspects such as the presentation of the results of group discussions, the way students use tools and experiment materials, conduct experiments and observe [18] the results of experiments show that the value of experiment class skills almost every
meeting is higher than the control class. However, at the first meeting the control class was higher than the experiment. This is because the students in the experiment class at that time were urged to prepare the art practice exam. So, students were less focused in the classroom. As they present the results of discussion, the conclusions they make were less precise.

Obstacles experienced by researchers when using the media labyrinth on colloid subjects is happening at the first meeting. When I explain how to use the media, students are still confused and still wondering how to use it [19]. The second obstacle that I experienced was when the students have got the answer and the way on the labyrinth media, the students are scrambling to deliver the answer. Students should randomly ask the right answer and the correct media path of the labyrinth so that the classroom atmosphere is maintained and noisy [20]. Problems experienced can be overcome by the teacher by playing a role guide and direct the students to keep memorizing the answer until the teacher asks the answer to the student.

4. Conclusion
The use of labyrinth media on the subject of colloids can improve the student motivation in class XI IPA SMA Negeri 8 Pekanbaru. The improvement of students learning motivation through the use of labyrinth media on colloid subjects in class XI IPA SMA Negeri 8 Pekanbaru in the experiment class is 66.14% in very high category. Based on the data processing and discussion obtained \( t_{\text{count}} > t_{\text{table}} \), i.e. 2.63 > 1.67, so it can be concluded that the labyrinth media can improve student learning achievement on Colloid subjects in class XI IPA SMA Negeri 8 Pekanbaru. N-Gain students learning achievement in experiment class learners was 0.8633 which belongs to high category.

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