THE INFLUENCE OF THE 6-PHASE LEARNING CYCLE - THINK PAIR SHARE LEARNING MODEL ON LEARNING OUTCOMES AND STUDENT RETENTION ON CHEMICAL EQUILIBRIUM MATERIALS

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Abstract. *This study aims to decide the influence of the Learning Cycle 6 Phase - Think Pair Share learning model on knowledge results and student retention on chemical equilibrium material. The research design was a quasi-experimental research design without a pretest (posttest-only control group design). All students of class XI MAN 1 Kota Malang were used as the population in this study. The sample selection was carried out using the cluster random sampling technique and 2 research groups were acquired. Class XI MIPA 6 was selected as the experimental class using the Learning Cycle 6 Phase - Think Pair Share learning model while class XI MIPA 5 was selected as the control class using the Learning Cycle 6 Phase. The number of students in class XI MIPA 5 was 36 students, while the amount of students in class XI MIPA 6 was 34 students. The measurement instrument used is a test. The test was carried out after being given treatment to measure students' skills to recognize the concept of chemical equilibrium. In addition, there is a retention test that is held 1 week and 1 month after students study chemical equilibrium material without prior notification. Test the hypothesis to determine whether there was a substantial difference in education outcomes and retention between schoolchildren taught by the 6-Phase Learning Cycle - Think Pair Share learning model and students taught with the 6-Phase Learning Cycle model in chemical equilibrium material with the Independent Sample T-Test. The data analysis technique used consisted of preliminary analysis consisting of a normality test and homogeneity test and analysis of results consisting of hypothesis testing. The outcomes of the Independent Sample T Test showed a likelihood worth of fewer than 0.05 which indicated that there was a substantial difference between the knowledge outcomes of the experimental group and the control group. The probability values of retention tests I and II are also smaller than 0.05. This shows that there is a substantial difference amongst the retention test of the experimental group and the control group on retention tests I and II. The outcomes of this research show that the midpoint knowledge outcomes in the experimental group are higher than the midpoint knowledge outcomes in the control group, namely 77 in the experimental class and 71 in the control class. This proves that the Learning Cycle 6 Phase - Think Pair Share learning model has an effect on student learning outcomes of MAN 1 Kota Malang on chemical equilibrium material. This model also affects student retention.*

Keywords: *Learning Cycle, Learning Outcomes, Retention, Chemical Equilibrium*

INTRODUCTION

Education is one of human efforts to change latent through the learning process in order to have religious spiritual competence, self-control, personality, intelligence, moral character, and the skills needed by himself, society, nation and country. Education activities in schools are created to develop abilities, cognitive, psychomotor, and affective abilities. One of the subjects taught at school is chemistry. Chemistry has complex concepts and requires mathematical skills to solve problems. In addition, most chemistry is abstract, such as the concepts of atoms, molecules, and chemical bonds. The sequential nature of chemical material also requires students to understand the previous material before changing it to another material. One of

the chemistry materials taught in SMA/MA is chemical equilibrium.

Chemical equilibrium is one of the most difficult chemicals (Sinaga, 2022). This is because in understanding the concepts in it, it is necessary to understand the previous concepts, such as the mole concept, stoichiometry, ideal gas law, and reaction rates. These concepts are related to the concept of chemical equilibrium and are needed especially in solving calculation problems (Sinaga, 2022). In addition, the material of chemical equilibrium contains many abstract concepts, including dynamic equilibrium involving reversible and irreversible reactions, forward and reverse reaction rates, as well as homogeneous and heterogeneous equilibrium; move in equilibrium outstanding to the influence of concentration, compression, temperature, and catalyst involving Le Chatelier's principle; and the equilibrium constant. In fact, most of the problems given during learning only focused on calculation problems. As a result, many students only know how to answer calculation issue without comprehend the theory.

The number of difficulties experienced by students requires teachers to create learning that can build conceptual and algorithmic knowledge in a systematic and structured manner. In addition, a learning model is required that can help a schoolchild to expand the concepts that have been built so that they can be used to solve various conceptual and algorithmic problems. This is because the learning model is very important to use as a teaching strategy to overcome various learning problems in schools (Helsy, 2017). The 6-Phase Learning Cycle learning model is one of the learning models that can be used.

The 6 Phase Learning Cycle learning model is a cognitive constructivist-based learning model developed based on Piaget's theory. This model consists of a learning objective identification phase, an invitation or appointment phase, an search phase, an description or explanation phase, an embellishment phase, and an assessment phase. The identification stage of learning objectives aims for students to know what will be learned so that they focus on learning. Before entering the core material, the teacher generates students' prior knowledge through queries correlated to the substantial to be considered. During the exploration phase, an assimilation procedure happens, where schoolchildren practice their intellectual constructions to answer to their environment. If students are not able to adapt between cognitive structures and their environment, disequilibrium will occur. This results in an accommodation process, where there is a change in the existing cognitive structure and new knowledge are formed. This knowledge is used to solve new problems in the elaboration phase (Hermawan, 2017).

The learning process occurs in the Proximal Development Zone (ZPD), where children cannot solve problems individually until they can solve them with the help of others. This shows that interaction with peers can make students' cognitive structures develop higher. The same thing was stated by Piaget, that social interaction is very important in the development of one's knowledge. Group discussion activities can help them to understand the material. As a result, not only does academic achievement increase but also can improve students' social skills and ability to work together productively (Tembang, 2017). Learning that emphasizes interaction with peers in building knowledge is called cooperative learning.

One of the cooperative learning models is the Think Pair Share learning model. This learning model offers chances designed for pupils to actively contemplate individually first. After that, students are given the opportunity to discuss with the partner next to them before going to a larger group (Witaningtyas, 2016). The Pair phase acts as a scaffolding given by the teacher and his peers to him. This is so that they can solve problems that they cannot solve on their own (Tembang, 2017).

The merging of the two learning models requires students to interact with their peers. In addition, the pattern of discussion that occurs between students is more structured or organized so that the class atmosphere remains conducive and minimizes students working competitively and individually. The existence of this interaction between students will be mutually beneficial in achieving learning objectives (Sumiyati, 2016). This is because the elaboration phase combined with the pair and share phases, provides more opportunities for students to interact in constructing knowledge,

thus enabling the process of mutual correction of knowledge. This activity aims to develop or improve the knowledge already possessed so that learning becomes more meaningful. As a result, it allows the repetition (rehearsal) of knowledge construction, so that the information obtained can be stored in working memory. The more frequent repetition is carried out during the discussion, the more information stored in working memory can move into long-term memory (Yulianingtyas, 2017). This has an impact on learning outcomes and increased student retention.

Based on the literature study, the combination of the two learning models has never been applied to chemical equilibrium material and has never been done in MAN 1 Kota Malang. In addition, students of MAN 1 Kota Malang also have difficulty applying the concept of calculation (stoichiometry) to the concept of the equilibrium constant. This is supported by data on daily test scores in the previous year where there were still some pupils who scored underneath the least wholeness standards (KKM = 80), including 19% of students at group XI MIPA 4 and students in group XI MIPA 5 by means of much as 22%. Therefore, the use of the Learning Cycle 6 Phase - Think Pair Share learning model is expected to assist students in constructing their knowledge, so as to improve learning outcomes and retention. Based on this statement, investigators are focused on exploring "The Influence of the 6-Phase Learning Cycle Model - Think Pair Share on Learning Outcomes and Student Retention on Chemical Equilibrium Materials"

METHOD

The populace used at this research were scholars of group XI MIPA MAN 1 Kota Malang which consisted of 6 classes. The models used at the research were 2 classes, group XI MIPA 5 as the control group using the Learning Cycle 6 Phase learning model then group XI MIPA 6 in place of the experimental group with the Learning Cycle 6 Phase learning model - Think Pair Share. The amounts of pupils in the experimental group were 34 pupils by actualities of 8 male pupils and 26 female pupils, while the number of pupils in the control group was 36 students by details of 10 male pupils and 26 female pupils. The selection of the investigative taster was carried out through a cluster random sampling technique. This category of investigative design is a quasi-experimental investigative strategy without a pretest (posttest-only control group design). The quasi-experimental design chart can be realized in Table 1.

Table 1. Quasi-experimental Investigate Design Chart

Subject	Retest	Action	Posttest
Experiment Class	-	X_1	O_1
Control Class	-	X_2	O_1

Information:

O_1 = posttest measurements were carried out after the treatment

X_1 = learning with the 6-Phase Learning Cycle model - Think Pair Share

X_2 = education by the 6-Phase Learning Cycle model

The learning steps accomplish in the 6 Phase LC learning are: Phase 1: Identification, the teacher identifies learning objectives. Phase 2: Engagement, the educator asks queries toward schoolchildren to discover their initial knowledge. Phase 3: Exploration, Students carry out experiments, data mining, examine experimental information and draw a denouement based on the experiments that have been carried out. In addition, students can make observations from pictures and conduct literature reviews from various sources. Phase 4: Explanation, Students explain the results of their exploration so that new knowledge is generated. Phase 5: Elaboration, the teacher gives new problems by giving questions and students solve them. Phase 6: Evaluation, Students work on post-test questions.

Learning with LC 6 Phases – TPS has phases 1, 2, 3, 4, and 6 which are the same as in learning with LC 6 Phases, but in Phase 5: Elaboration-TPS The teacher gives new problems and asks students to solve them individually. Then ask students to discuss in pairs (2 people). After the discussion with their partner, the teacher asks each group to pair up with another group (4 people) to share the information that was discussed previously. Then carry out class discussions and the teacher provide reinforcement of the student's concept. The instruments used in this study contained education tools and measurement tools. The education tools used comprise Education

Application Tactics (RPP) then LKS on chemical equilibrium material. The measurement instrument used is a test. The test was carried out after being given treatment to measure students' skills to comprehend the theory of chemical equilibrium. In addition, there is a retention test which is held 1 week and 1 month after students learn the chemical equilibrium material without prior notification. The questions used to measure retention were developed based on the same indicators as the indicators for the learning outcomes test so that the two tests measure the same concept but have different editorials. Retention tests are carried out to determine students' memory of a given material. Before the test questions were used for data collection, instrument trials were carried out. This is important to know the level of cogency and dependability of the substances. The examination results are then analyzed to select and refine the items to be used in the test.

RESULT AND DISCUSSION

Description of Student Initial Ability Data

The value of the student's initial ability comes from the day-to-day test notches on the preceding topic, namely the reaction rate material. This value was analyzed to control the average early aptitude of the investigational group and the control group. The tests used in this analysis are the normality examination, homogeneity examination, and t-test by the Independent Sample t Test.

The normality examination was done to determine even if the initial ability information of the control group and the experimental group were normally dispersed. The outcomes of the normality test of scholars' initial abilities in the experimental group and control group are shown in Table 2.

Table 2. Normality Test Outcomes of Schoolchildren's Early Skill

Class	X^2_{count}	X^2_{table}	Probability value	Conclusion
Experiment	4.576	14.067	0.712	Normal distribution
Control	12.588	15.507	0.127	Normal distribution

The hinge on Table 2, it can be known that $X^2_{count} < X^2_{table}$ both in the experimental group and the control group. This shows that the early ability information aimed at the experimental group and the control group is normally dispersed.

The homogeneity examination was done to control even if the early skill data of the control group and the experimental group were homogeneous. The outcomes of the homogeneity test of schoolchildren's initial abilities in the experimental group and control group are shown at Table 3.

Table 3. Outcomes of the Homogeneity Examination of Schoolchildren's Initial Abilities

	F_{count}	Probability value	Conclusion
Initial ability	1.843	0.179	Homogeneous data

The hinge on Table 3, it can be known that the probability worth is (0.179) > (0.05). This knows that the initial ability data of the experimental group and control group are homogeneous.

The t-test was used to control even if there was a substantial difference between the midpoint initial ability of the control group and the experimental group. The outcomes of the initial ability t-test of schoolchildren in the experimental group and control group are shown at Table 4.

Table 4. Results of Students' Initial Ability t-Test

	t_{count}	Probability value	Conclusion
Initial ability	1.693	0.095	There is no substantial change

The hinge on Table 4, it can be seen that the probability value is (0.095) > (0.05). This shows that there is no substantial change between the average early ability of the experimental group and the control group.

Description of Learning Outcome Data

Before testing the hypothesis, the analysis precondition examination is accomplished first. This prerequisite examination consists of a normality test and a homogeneity test. Similar

to the student's initial abilities, the normality examination of knowledge outcomes was used to determine whether the data on the knowledge results of the control group and the experimental group were normally distributed. The outcomes of the normality examination of student knowledge results in the experimental group and control group are shown in Table 5.

Table 5. Normality Examination of Student Knowledge Outcomes

Group	X^2_{count}	X^2_{table}	Probability worth	Conclusion
Experiment	3.882	12.592	0.693	Normal distribution
Control	5.200	12.592	0.518	Normal distribution

The hinge on Table 5, it can be known that X^2_{count} in both the experimental group and control class is smaller than X^2_{table}. This shows that the knowledge results of the experimental group and the control group are normally dispersed.

The homogeneity test was used to determine whether the data on the learning outcomes of a control class and an experimental class was homogeneous. The outcomes of the homogeneity examination of student knowledge results in an experimental group and control group were shown at Table 6.

Table 6. Test of Homogeneity of Student Learning Outcomes

	F_{count}	Probability value	Conclusion
Learning outcomes	0.632	0.429	Homogeneous data

The hinge on Table 6, it can be known that the probability value is (0.429) > (0.05). This shows that the knowledge results of the experimental group and control group are homogeneous.

Hypothesis testing using Independent Sample t Examination. This assessment was done to decide whether there is a significant difference between the learning outcomes of the control group and the experimental group. The outcomes of hypothesis testing on student learning results in the experimental group and control group are shown in Table 7.

Table 7. t-test Student Learning Results

	t_{count}	Probability value	Conclusion
Learning results	2.221	0.03	There is a significant difference

A hinge on Table 7, it can be known that the probability value (0.03) < (0.05). This shows that there is a significant difference between the learning results of the experimental group and the control class.

Description of Data Retention

Student retention data was taken from the results of retention tests which were carried out twice, namely 1 week and 1 month after students studied chemical equilibrium material. The tests used in this analysis are the normality examination, homogeneity examination, and t-examination. The retention data of control group and experimental group students during 1 week and 1 month after schoolchildren learn chemical equilibrium can be seen in Table 8.

Table 8. Retention Test Normality Test

Retention Test	**Class**	X^2_{count}	X^2_{table}	**Probability value**	Conclusion
I	Experiment	8	12.592	0.238	Normal distribution
	Control	11	15.507	0.202	Normal distribution
II	Experiment	2.235	12.592	0.897	Normal distribution
	Control	3.412	11.070	0.637	Normal distribution

Based on Table 8, X^2_{count} in both the experimental group and control group is smaller than X^2_{table}. This illustrates that the retention test data I and II in the experimental group and control group are normally dispersed. The outcomes of the homogeneity examination of student retention tests in the

experimental group and control group are exposed in Table 9.

Table 9. Retention Test Homogeneity Examination

	F_{count}	Probability value	Conclusion
Retention Test I	2.938	0.091	Homogeneous data
Retention Test II	2.761	0.101	Homogeneous data

Stand on Table 9, the probability worth of retention tests I and II are more than (0.05). This illustrates that the retention test numbers I and II in the experimental group and control group are the same. The retention test t test uses the Independent Sample t Test. This assessment is used to fix whether the retention test of the control group and the experimental group has a significant difference. The outcomes of the student retention examination hypothesis test in the experimental group and control group are exposed in Table 10.

Table 10. t-test Retention test

	t_{count}	Retention Test	Denouement
Retention Test I	7.138	0.000	There is a significant difference
Retention Test II	6.456	0.000	There is a significant difference

Stand on Table 10, the probability worth of retention tests I and II is smaller than (0.05). This shows that there is a substantial difference among the retention test of the experimental group and the control group on the retention tests I and II.

The Efficiency of the 6-Phase Learning Cycle Learning Typical - Think Pair Share on Learning Results

Stand on the midpoint learning results, the midpoint of the experimental group was 77 while the control group was 71. The results showed that the learning results of schoolchildren who were trained by the Learning Cycle 6 Phase - Think Pair Share learning model was higher than schoolchildren who were trained by the education model Learning Cycle 6 Phases. The outcomes of this research show that the application of the Learning Cycle 6 Phase – Think Pair Share learning model has an effect on student knowledge results on chemical equilibrium material.

The midpoint scholar learning results of the experimental group were higher than the control group because, during the elaboration phase, students were given the opportunity to independently apply the concepts they already had to new situations (think phase). This activity aims for students to be able to connect between concepts so that their understanding becomes better. In addition, in this phase, students are given the opportunity to measure the amount of their thoughtful of the topic that has been studied. After completing the task individually, they are given the opportunity to discuss it with their partner. After discussing with their partners, the teacher asks group pairs to share the information that has been discussed previously with classmates. This activity aims to find similarities or differences of opinion between each pair. When there is a cognitive conflict, they are given the opportunity to equate perceptions with their peers. They can discuss opinions that may differ from one student to another, then they can jointly build new concepts (Jeharut, 2020). In addition, group discussion activities can also motivate students who are reluctant to enquire a problem that they do not comprehend (Izzati, 2016).

The merging of the two education models requires students to interact with their peers. In addition, the pattern of discussion that occurs between students is more structured or organized so that the class atmosphere remains conducive and minimizes students working competitively and individually. The existence of this interaction between students will be mutually beneficial in achieving learning objectives (Sumiyati, 2016). This is because the elaboration phase combined with the pair and share phases, provides more opportunities for students to interact in constructing knowledge, thus enabling the process of mutual correction of knowledge. This activity aims to develop or improve the knowledge already possessed so that learning becomes more meaningful. As a result, it allows the repetition (rehearsal) of knowledge construction, so that the information obtained can be stored in working memory. The more frequent repetition is carried out during the discussion, the more information stored in

working memory can move into long-term memory (Yulianingtyas, 2017). This has an influence on learning results and increased student retention.

The Effectiveness of the 6-Phase Learning Cycle Learning Model - Think Pair Share Against Retention

The success of learning can be known after conducting evaluation activities. This activity aims to discover how much schoolchildren comprehend the material that has been educated. In addition to motivating students to continue learning (Hermawan, 2017), the results of this evaluation can be used as a basis to see whether the learning objectives have been achieved. The form of evaluation has the shape of a test, both a written exam and an oral test, but in this research only a paper and pencil test. In addition to learning outcomes tests, researchers conducted a retention test.

The retention test is intended to determine the pupil's memory of a topic that has been given after several weeks of learning takes place. Retention tests are carried out 1 week and 1 month after students learn the chemical equilibrium material without prior notification. The questions used to measure retention were developed based on the same indicators as the learning outcomes test indicators so that both tests measure the same concept. The editorial questions on the retention test were made different from the learning outcomes test questions. This is because the time difference is only 1 week after the learning outcomes test. While the editorial questions on the retention test II were made the same as the learning outcomes test but randomized the number of questions and answer choices.

The outcomes presented that in the retention test I there was a substantial difference between the experimental group and the control group with a probability value of < (0.05). Likewise in the retention test II. When observed from the midpoint worth of the class, in the retention test I the experimental group averaged 79, although in the control group it was 58. In the second retention test, the experimental group average was 80, while in the control group it was 62. Stand on the test statistics and class averages, there is a substantial difference among the experimental group and the control group on both retention tests. However, if you compare the experimental class averages on the retention tests I and II, they are not significantly different. Likewise in the control group.

In the control group, there was a important decrease in the value of the learning outcomes of 77 to 58 on the retention test I. This probably occurred because of the unstructured discussion pattern during the elaboration phase. As a result, the interaction between students is less than optimal. This also occurs in research conducted by Yulianingtyas (2017). They conducted an experiment by applying three different methods, namely: 1) the traditional method carried out in the classroom, 2) the traditional method coupled with fieldwork, and 3) the traditional method that included active information processing in the fieldwork. The outcomes presented that schoolchild who were trained by the third method lost 10% of their information while the others lost 40% of their information. The outcomes of this research prove that education that involves schoolchildren actively plays a role in their long-term memory (Jeharut, 2020). However, the outcomes of the retention tests I and II showed that schoolchildren who were trained with the 6-Phase Learning Cycle - Think Pair Share learning model was higher than the schoolchildren trained with the 6-Phase Learning Cycle learning model.

CONCLUSION

Stand on the description that has been explained, it can be determined that:

1. Learning Cycle 6 Phases - Think Pair Share learning model has a consequence on schoolchild knowledge outcomes on chemical equilibrium material. This is shown from the average schoolchild learning results of the experimental group of 77 while in the control group of 71.
2. Learning Cycle 6 Phases - Think Pair Share education model has a consequence on schoolchild retention. Based on the class average, in the retention test I the experimental group averaged 79 while in the control group, it was 58. In the second retention test, the experimental group average were 80 while in the control group, it were 62.

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