

# The Effects of Jigsaw Technique on Learning Achievement and Retention of Science Teacher Students

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## Abstract

The cooperative learning Jigsaw technique is one learning management that promotes learning in the 21st century, and it is a learning management that promotes student learning achievement. Therefore, the researcher is interested in studying the learning achievement of science teacher students before and after learning with the Jigsaw technique and exploring the retention of students' learning using the experimental research. The participant in this research consisted of 32 second-year students in the Department of General Science at Rajabhat University in southern Thailand who enrolled in the course Learning Management 1 in the first semester of the academic year 2022. The research tools consisted of 1) the JIGSAW technique lesson plan and 2) a learning achievement test. The statistics used in data analysis were mean standard deviation and dependent Sample *t*-test. The result of the learning achievement test of the science teacher students who learned by using the Jigsaw technique found that the mean score of learning achievement after learning was significantly higher than before learning at the .05 level. After the 2-week learning period, it revealed that the student's learning achievement was not different from after learning at the statistical significance level of .05. The findings suggest that the Jigsaw technique is one learning management that can improve learning achievement and learning retention. So, it can be applied to subjects that focus on cognitive learning.

**Keywords:** Jigsaw Technique, Learning Achievement, Learning Retention

## Introduction

The world has changed from the 20th to the 21st century. It has affected society, the economy, and the environment, including education which must be adjusted under the 21st century. Therefore, teachers who play an important role in driving education must manage learning to promote skills in the 21st century. Learning management is one factor in learners' academic success (Negash et al., 2022). Suppose the learners can study in an independent atmosphere; helping each other and interacting in class opens opportunities for self-learning. In that case, they can practice until they gain knowledge and understanding of the lesson. In addition, they have learning retention, social skill, and emotional skill for working and living with others in society, especially the learning of undergraduate teacher students. They know that knowledge must be taken in learning management in educational institutions in the future.

The researcher's teaching experience found that students lack support and responsibility in working with others, including learning just memorization to achieve good academic achievement. When time passes or reviews students, they lack knowledge and understanding of past lessons. One way to solve the above problem is that learning activities should be organized and encourage students to work together, focus on individual differences, help each other, and learn by themselves. One learning management is cooperative learning (Osei & Appiah-Twumasi, 2021), which is student-centered learning management by dividing the students into small groups. It consists of members with different abilities. Group members have the goal of working together, cooperation, and helping each other (Johnson et al., 2013). It improves cognitive and psychic achievement (Van Ryzin et al., 2020). It also promotes self-learning. Learners are supported by teachers and learning materials and get help from group members (Jacobs & Chau, 2021). There are many types of cooperative learning arrangements which is a technique that has been more widely popular than other techniques consisting of Student Team Achievement (STAD), Team Game Tournament (TGT), and Jigsaw II (Gull & Shehzad, 2015). The past findings showed that learning management could improve academic achievement and retention as Jigsaw Technique (Huang et al., 2013; Chu, 2014, Van Dat, 2016).

Jigsaw Technique is a cooperative learning technique by learners with different abilities joining a group called the home group. Each member in the home group is responsible for studying different topics and then moving to a new group on the same topic, called the expert group. When the expert group has successfully worked together, they will move back to the original group, which is their home group, to bring knowledge gained from discussions from expert groups to summarize it for the house group, teachers test and give scores (Aronson et al., 1978; Sari et al., 2016). In addition to learning achievement and retention, results from learning management can help learners be motivated to achieve higher, have a better learning attitude and have social skills that prepare students for life in the real world. This is a world that relies more on

cooperation than competition. In addition, it helps to promote students' communication skills and rational thinking processes at a higher level.

Although there are few international studies on learning about the Jigsaw technique (Gul & Shehzad, 2015; Suendarti & Virgana, 2016, Tabiolo & Rogayan, 2019; Sari et al., 2016), in Thailand, especially in the context of teacher students undergraduate, developing students to have academic achievement and learning retention, and very necessary social skills. From the problems and reasons mentioned above, this research article presents the results of the development of learning activities in the course "Learning Management 1", which is a subject that consists mainly of theoretical content that requires memorization and understanding. Therefore, there are research questions "What will be the student's post-school learning achievement? and will there be learning retention when learning with the Jigsaw technique?"

## **Materials and Methods**

This research employed experimental research: the one-group pretest-post test design (Cohen, 2000). The research was conducted as follows;

## **Participants**

The participant is 32 second-year general science students from Rajabhat University in southern Thailand, who enrolled in the course "Learning Management 1", in the first semester of the academic year 2022.

## **Research Instruments**

The Jigsaw technique lesson plan in the course "Learning Management 1" has four plans which consist of 1) Learning theory, 2) method and learning management integration, 3) The design of learning management is consistent with the development of learners in integrating learning management in the 21st century and 4) Learning activities and creating a classroom atmosphere, which totals 16 weeks. The content validity of the Jigsaw technique lesson plans was verified by three experts in the field of science education. The index of item-objective congruence is in the range between 0.67-1.00.

The academic achievement test in the course of Learning Management 1, has a multiple-choice test with four choices of 40 items. The content validity of the learning achievement test was verified by three experts in the field of science education. The index of item-objective congruence is in the range of 0.67-1.00. After trying out with 30 pre-service science teachers, The Discrimination testing is in the range between 0.33-0.85, item difficulty is in the range between 0.32-0.76, and the Kuder -Richardson reliability coefficient was calculated and equaled 0.786.

### Data Collection

The researcher conducted the pre-test with the learning achievement test and conducted the Jigsaw technique. After finishing learning, the researcher performed the posttest with the original learning achievement test.

After two weeks, the researcher measured learning retention using the original learning achievement test. After that, the researcher collected

the test for further statistical analysis.

### Data Analysis

The researcher collected the pretest and posttest of learning achievement tests and analyzed the mean and standard deviation, and the hypothesis was tested using a dependent sample t-test. Using the original test measured learning retention, analyzed the mean and standard deviation, and compared the learning retention of mean and the standard deviation of learning achievement after two weeks of learning by dependent sample t-test.

### Results and Discussion

Before learning by using Jigsaw Technique, the mean score for learning achievement was 13.5625 and the standard deviation was 2.381, and after learning, students had a mean score of learning achievement of 34.1875, and a standard deviation was 1.925, which was significantly higher than before learning at the .05 level as shown in Table 1.

**Table 1 A Mean Comparison of Learning Achievement Scores before and After Learning by using the Jigsaw Technique**

Test	N	Score	X	S.D.	t	p
Pre-test	32	40	13.5625	2.381	-36.229*	0.00
Post-test	32	40	34.1875	1.925		

And when comparing the learning achievement after learning for two weeks, it found that the students had the mean score of learning achievement after learning was 34.1875 and the standard deviation was 1.925, and after two weeks of study, it found that the mean score of learning achievement was 33.4688

and the standard deviation was 3.601 which showed that the learning achievement scores after two weeks of study were not different from those of the jigsaw technique at the statistically significant level of .05 as shown in Table 2.

**Table 2 A Mean Comparison of Learning Achievement Scores after Learning and After Learning 2 Weeks by using Jigsaw Technique**

Test	N	Score	X	S.D.	t	p
Post-test	32	40	34.1875	1.925	1.089*	0.285
Post-test 2 weeks	32	40	33.4688	3.601		

\*p< .05

### Discussion

The results of the learning achievement test for the course “Learning Management Science 1” showed that after learning with the Jigsaw technique, the student’s learning achievement was significantly higher than before learning at the .05

level. It is consistent with Aydin and Biyikil’s (2017) research that found that the Jigsaw technique made the academic achievements of students studying in Physics Laboratory 1 subject higher than students learning in normal classrooms. One of the reasons is that it is a technique that emphasizes the collaboration

of the members, whereby members of the first group moved to study different topics and then returned to the group to pass on the knowledge acquired to the members of the group to gain knowledge and understanding in all issues. When students have positive interdependence, one component of cooperative learning, all students feel that Group members are important, and the success of a group depends on every member. At the same time, each member can be successful only if the group is successful. The success of individuals and groups depends on cooperation, so each member must be responsible for their responsibilities, and meanwhile, they must help other members for mutual benefit. The result of greater efforts to achieve affects higher learning achievement (Johnson & Johnson, 1987; Chen et al., 2020). Techniques may also cause it, but members are responsible for the issue assigned to seek knowledge and understand thoroughly so that everyone is fully immersed in the assignment. Group members must have discussions and exchange ideas to understand the issues learned together. Learning by working in groups allows members to have face-to-face interaction. It is a method that can improve student achievement and satisfaction (Tran & Lewis, 2012; Felder & Brent, 2007).

Another important reason is that the Jigsaw technique is a cooperative learning technique. The outstanding feature of this knowledge management is that the group members consist of learners with different abilities. Therefore, the strong learners must try to explain multiple things to the weaker group members with various contents, resulting in group members having a better understanding of those contents. Helping and working together increases the learning motivation of learners with low and moderate abilities, resulting in the development of students' learning. The results of research in the past revealed that cooperative learning management could be developed the academic achievement of learners to be better than normal learning, and it is learning management that increases student learning achievement (Karali & Aydemir, 2018; Adham & Mahmudah, 2021; Kaanklao, N., & Suwathanpornkul, 2020).

The results of the research also revealed that after learning for two weeks, the student's

learning achievement was not different from after learning with the Jigsaw technique at the statistical significance level of .05, which showed that students who studied with the Jigsaw technique had learning retention consistent with the findings of Tran (2014) and Chianson et al. (2010). It found that after learning with cooperative learning for eight weeks, students had more learning retention than students who learned with lectures, statistically significant at the .05 level. This showed that cooperative learning management promotes academic achievement and learning retention. This finding may be due to the Jigsaw technique that students are divided into home groups. The members of the home group are responsible for studying different topics. Then they move to a new group on the same topic, and this new group is called the expert group. When the expert group has finished working together, they move back to the original group, which is their home group, to bring knowledge gained from discussions with experts to summarize for their home group. The students search for knowledge and discuss it together for group members to understand. These things allow students to learn on their own and understand the lesson, leading to retention in learning. When members within the group have interpersonal interaction, they create skills for working in small groups, mutual acceptance, and trust in each other. As a result, students within the group helped pass on knowledge, which encouraged students to learn more independently (Johnson and Johnson, 2014). In addition, it may be caused by group members' communication during exchanging ideas and explaining the issues assigned to them in their native language. These can make members fully understand and share responsibility for their group's success. This supports the idea of Yapici (2016) and Fitriana et al. (2022) that many factors make learners persist in learning from cooperative learning, such as in-group communication, interaction, enthusiasm for collaboration, high motivation to learn, responsibility for assigned duties, and desire to achieve common goals for the success of the group.

## Conclusion

The result of the learning achievement test of the science teacher students who learned by using

the Jigsaw technique found that the mean score of learning achievement after learning was significantly higher than before learning at the .05 level. After the 2-week learning period, it revealed that the student's learning achievement was not different from after learning at the statistical significance level of .05. The findings suggest that cooperative learning management by Jigsaw technique is one learning management that can improve learning achievement and learning retention. So, it can be applied to subjects that focus on cognitive learning.

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