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O efeito do modelo de aprendizagem e a avaliação das tarefas em relação aos resultados de aprendizagem da ciência pelos alunos, controlando o conhecimento prévio dos alunos

The Effect of Learning Model and Task Assessment Regarding Student Learning Outcomes of Science by Controlling Student Prior Knowledge

El efecto del modelo de aprendizaje y la evaluación de tareas con respecto a los resultados de aprendizaje de la ciencia por parte de los alumnos mediante el control del conocimiento previo de los alumnos

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Resumo

O objetivo desta pesquisa é descobrir o efeito do modelo de aprendizagem e avaliação da tarefa em relação à realização da ciência, controlando o conhecimento prévio do aluno.Esta pesquisa é experimental que possui desenho fatorial 2 x 2. Amostras para esta pesquisa são estudantes que contrataram conceitos básicos da Ciência. A amostra feita por amostragem aleatória simples. Posteriormente, os resultados mostraram que: (1) os resultados de aprendizado da ciência do aluno que foram ensinados usando modelos cooperativos do Jigsaw são maiores do que aqueles ensinados usando o modelo cooperativo do STAD controlando o conhecimento prévio do aluno, (2) os resultados da aprendizagem científica dos alunos avaliados avaliações estruturadas são mais altas do que aquelas avaliadas usando avaliação de portfólio através do controle do conhecimento prévio do aluno, (3) há um efeito de interação entre o modelo de aprendizagem e a avaliação da tarefa sobre o desempenho dos alunos na ciência da aprendizagem através do controle do conhecimento prévio do aluno; os alunos que foram ensinados usando o modelo Jigsaw são maiores comparados àqueles ensinados usando modelos STAD para o grupo de alunos com avaliação usando avaliação estruturada pelo controle do conhecimento prévio do aluno, (5) realização de ciências dos alunos que foram avaliados usando avaliação estruturada são mais baixos comparados para aqueles que avaliaram usando avaliação de portfólio para o grupo de stude nts ensinados usando o modelo STAD, controlando o conhecimento prévio do aluno. Assim, o efeito linear do conhecimento

prévio sobre os resultados de aprendizagem dos estudantes da ciência não tem diferença significativa entre quatro grupos de estudantes formados por modelo de aprendizagem e inteligência..

Palavras-chave: Modelo de Aprendizagem, avaliação de tarefas, resultados de aprendizagem de ciências dos alunos, conhecimento prévio do aluno.

Abstract

The purpose of this research is to find out the effect of learning model and task assessment regarding achievement of science by controlling student prior knowledge.This research is experimental which have factorial design 2 x 2. Samples for this research are students who had contracted basic concepts of science. The sample taken by Simple Random Sampling. Afterward, the results showed that: (1) science learning outcomes of student which have been taught using Jigsaw cooperative models are higher than those taught using STAD cooperative model by controlling student prior knowledge, (2) science learning outcomes of students who are assessed using structured assessment are higher than those assessed using portfolio asssessment by controlling student prior knowledge, (3) there is an interaction effect between learning model and the task assessment on achievement of students in learning science by controlling student prior knowledge, (4) science achievement of students who have been taught using Jigsaw model are higher compared to those taught using STAD models for the group of students with assess using structured assessment by controlling student prior knowledge, (5) science achievement of students who have been assessed using structured assessment are lower compared to those who assessed using portfolio assessment for the group of students with taught using STAD model by controlling student prior knowledge. Thus, the linier effect of prior knowledge on student learning outcomes of science does not have significant difference between four groups of students formed by learning model and intelligence..

Keywords: Learning Model, task assessment, science learning outcomes of students, student prior knowledge.

Resumen

El propósito de esta investigación es averiguar el efecto del modelo de aprendizaje y la evaluación de tareas con respecto al logro de la ciencia mediante el control de los conocimientos previos de los estudiantes. Esta investigación es experimental y tiene un diseño factorial 2 x 2. Las muestras para esta investigación son estudiantes que contrataron conceptos

básicos de Ciencia. La muestra tomada por muestreo aleatorio simple. Luego, los resultados mostraron que: (1) los resultados de aprendizaje de ciencias del estudiante que se han enseñado utilizando modelos cooperativos de Jigsaw son más altos que los que se enseñan utilizando el modelo de cooperación STAD mediante el control del conocimiento previo de los estudiantes, (2) los resultados de aprendizaje de ciencias de los estudiantes que se evalúan utilizando las evaluaciones estructuradas son más altas que las evaluadas mediante la evaluación de la cartera mediante el control de los conocimientos previos de los estudiantes, (3) existe un efecto de interacción entre el modelo de aprendizaje y la evaluación de tareas sobre el logro de los estudiantes en el aprendizaje de las ciencias mediante el control de los conocimientos previos de los estudiantes, (4) el logro de las ciencias los estudiantes a los que se les ha enseñado usando el modelo Jigsaw son más altos en comparación con los que se enseñan usando modelos STAD para el grupo de estudiantes con evaluación que usa una evaluación estructurada mediante el control del conocimiento previo de los estudiantes, (5) los logros en ciencias de los estudiantes que han sido evaluados utilizando una evaluación estructurada son menores en comparación A quienes evaluaron el uso de la evaluación de cartera para el grupo de estudios. No se enseñan utilizando el modelo STAD mediante el control de los conocimientos previos de los estudiantes. Por lo tanto, el efecto más claro del conocimiento previo sobre los resultados de aprendizaje de la ciencia por parte de los estudiantes no tiene una diferencia significativa entre los cuatro grupos de estudiantes formados por el modelo de aprendizaje y la inteligencia..

Palabras clave: Modelo de aprendizaje, evaluación de tareas, resultados de aprendizaje de ciencias de los estudiantes, conocimiento previo del estudiante.

1. Introduction

There are many education programs launched by the Government in globalization era. It surely can be a challenge to human resource itself. Competition that would be occurred today is the ability of human resource. It means that the ability of graduate education institution should be compatible to compete each other. Educational staff institution faces extraordinary challenge towards its graduate quality as a teacher in various level and school type.

Educational teacher specifically primary teacher education is a proof of the Government, educational and cultural ministry effort to improve quality of graduate. Since

educational teacher institution become primary teacher education closed or converted within the scope of college till now.

The graduate of educational staff institution considered to be success if it is determined by several internal and external factors of learners. It portrayed the one ability to follow the learning process in this institution. One of the factors that influence the success of learning is the selection of learning strategy. Therefore, learning must be arranged well to get a direct impact of learning toward behavior change (Uno, 2011).

Besides that, assessment is an important factor because it is the one of standards to know the ability of students in understanding the concepts. It is still used by the Government and any parties. Assessment can help either educational staff or learners to evaluate their selves. The evaluation of student achievement can be conducted by academics to determine whether she or he succeed or not; one of assessment criteria for the students that still be used is individual or group task assessment.

Many criticisms are aimed to the teachers because they too much emphasized on mere information/ concepts. It cannot be denied if concept is an important thing but it is not about the concept itself, rather it is dealing with how this concept can be understood by the students (Al-Tabany, 2014). Thus, it cannot be ignored because basic criteria that is used as the students' requirement does not necessary to mention their major study, so that every students can continue in the college without considering its major study. This phenomenon is continued and found many prospective students who come from vocational sciences are qualifying as students. It means that since they were in high school, they had not studied science, maybe even some did not like science, or did not interest in learning science until they graduated. However, they who were qualified as a student have science background but they were rejected from another university with top programs that they were chosen before.

Basic science concept is one of primary education teacher subjects which learn about common basic concept that has already taught in junior or senior high school. In fact, many students have difficulty to learn it because they need accuracy and seriousness as well as ability of science and Latin term, observations, experiments, and exercises in order to master the concepts of science as well as possible.

According to the explanation above, this research is needed to be conducted scientifically by using cooperative model and task assessment. It aimed to find other specific factors that can influence the science learning process as well as to find out the effectiveness of giving a task as an indicator of revealed the students' ability in understanding the simply

basic concept of science. Afterward, this research is aimed to find out the effect of learning model and task assessment regarding achievement of science by controlling student prior knowledge

1.1 Conceptual Description

1.1.1 Study Assessment of Science

Learning outcome is the result obtained by students in a particular period of teaching and learning process. Nana Sudjana (2014) stated that to be able to determine whether education and teaching are achieved or not, is needed efforts or assessment measures or evaluation. Gagne, Jenkins, and Unwin's opinion cited by Uno argued that learning outcome is learning experiences obtained by students in the form of certain abilities (Uno, 2007). According to Asep Jihat and Abdul Haris (2012), students' achievement is a form of behavior that tend to be settled from the cognitive, affective, and psychomotor of learning process carried out in a particular time. Dimyati and Mudjiono (2009) said that learning outcome is the final result of learning process. Learning outcome is the result of learning and teaching interaction. Mulyasa (2004) argued that learning outcome evaluation essentially is an activity to measure the behavior changes that have occurred. Therefore, science learning outcome is information capabilities and skills possessed by a student in understanding the concepts, theories, principles, and laws of teaching and learning process in a certain period based on learning objectives.

1.1.2 Science Characteristic in Primary teacher education

The teacher's point of view toward essence of science education will greatly influence the science learning profile that is held by teachers and students. Hence, a correct understanding of science education characteristics is absolutely necessary for the teacher. Those characteristics include at least the understanding and dimension or scope of science education.

There are seven scopes of science understanding; science is collection of knowledge, a search process (investigation), a collection of values, ways to get to know the world, social institutions, the result of human construction, and part of daily life (Hendri, 2015). Thus, the well characteristics of science education is students who have the ability to follow the steps of scientific work such as steps in skills process where the stages will train the students to think as same as scientists but in a simply level of thinking.

1.1.3 Cooperative Learning Model

Cooperative learning is one of the learning forms based on constructivism principle. However, this model is not the same as a study group and does not have to learn from the teacher. Cooperative learning strategy is a series of learning activities carried out by students in the group, to achieve defined learning goals. There are four important things in cooperative learning strategies, such as: (1) the presence of students in group, (2) rules for playing in group, (3) attempts to study in group, (4) competencies that must be achieved by group (Rusman, 2010). Therefore, cooperative learning is a learning about a certain topic that emphasizes on collaboration in group of students arranged by the teachers.

1.1.4 Jigsaw Cooperative Learning Model

This model is developed and tested by Elliot Aronson and his friends in Texas University. Jigsaw cooperative learning model takes the pattern of how a saw (zigzag) works, namely students do a learning activity by working with other students to achieve a common goal (Rusman, 2010). Jigsaw learning model is learning model that prioritizes student activity (student centered) by forming small groups of 3-5 people consisting of origin and expert groups. The teacher maintains the work of each group to emphasize the topic being discussed or if there is a group who have difficulty. At the end of the class, teacher is giving a quiz with the material discussed (Adiwarsito, 2015). Besides that, Rusman (2010), Trianto (2007), and Sutikno (2014) also have different opinions regarding the steps in learning the Jigsaw model.

Therefore, Jigsaw cooperative learning model is a group learning that emphasizes on the understanding the concept deeply through division of concepts. It must be mastered by each member of the original group who are part of the expert team and then return to the original group to jointly improve the mastery of the material in the discussion.

1.1.5 STAD Cooperative Learning Model

Type of cooperative learning, Student Teams Achievement Division (STAD), is one of cooperative learning model types by using small group with 4-5 members heterogony. It is started to explain the aim of study, indicator of material, group activity, quiz, and group reward (Trianto, 2007). STAD is divided into five main components such as class presentation, team, quiz, improvement score individual, team recognition (Wartika, 2014).

Some opinions about STAD cooperative learning steps are also claimed by Agib (2013), Sutikno (2014), and Wena (2011). Steps that are mentioned are giving a task. It is strategy of the teacher to the students to make them restudying and remembering the material.

It is in line with Karunia's opinion that structured assessment is learning with further understanding about the material that was arranged by the teacher to reach the competency. One of the efforts to improve the intensity of learning science is by giving structured task.

Definition of structured task has stated by Kholil (20150, Azlina (2010), Suganda (2012), and Haryono (2013). According to their opinion, it can be concluded that structured task is a task from the lecturer to the students to discuss and know further about the topic of subject according to various sources. It can be obtained by doing in a group or individual whether before or after the class and has to be done in a particular time in a form of report.

1.1.6 Portfolio Task Assessment

Portfolio term is defined differently by Wakhinuddin (2009), Supranata (2015), Sukanti (2010). Portfolio is a collection of students' tasks in a particular time and can be solved together between teacher and students. As cited by Sukanti (2010), Budimansyah stated that portfolio assessment is an effort to get the information continually and periodically about the process as well as the result of the insights' growth into the knowledge, attitudes, and skills of students that come from notes and documentation of their learning experiences.

According to the explanation above, it can be said that portfolio task assessment described as a file or document of information that consists of a students' collection that is collected, obtained by the best task assessment of students in one subject and certain time (mis or full semester).

1.1.7 Prior Knowledge of Student

Every student has the different potential with others. Arends cited by Rahmatan and Lilliasari argued that prior knowledge is a collection of individual knowledge and experienced gained throughout their lives, and what they are going to bring to a new learning experience. Tsing & Huang (2012), Santrock (2014), Majid (2014), dan Brown (2012) have different thought about prior knowledge. Bruner said that if an individual learns and develops his or her mind, so he or she exactly used his or her intellectual potential to think. Rutherford and Ahlgren argued that effective learning demands new ideas, sometimes even very basic thinking. Therefore, prior knowledge can be defined as knowledge possessed by a person whether it is obtained through a formal education process or knowledge gained from his or her experience in daily life with the surrounding environment which is sometimes not scientific yet and knowledge can be resistant.

2. Method

This research used an experimental method with a 2x2 factorial design. The variables in this study consist of: (1) Independent variables, including (a) Learning model and (b) Task assessment; (2) Dependent variables were the science learning outcomes. The independent variable of the learning model consists of two forms such as: (a) Jigsaw cooperative learning model, and (b) STAD cooperative learning model. However, the independent variable task assessment consists of (a) structured task assessment and (b) portfolio task assessment. Before conducting the experiment, the measurement of science prior knowledge is carried out to the covariable students. The research design is illustrated in the following matrix.

Task Assessment (B)	**Cooperative Learning (A)**	
	Jigsaw (A_1)	STAD (A_2)
Structured (B_1)	$[X,Y]_{11k}$ k = 1,2,... , n_{11} A_1B_1	$[X,Y]_{12k}$ k = 1,2,... , n_{12} A_2B_1
Portfolio (B_2)	$[X,Y]_{21k}$ k = 1,2,... , n_{21} A_1B_2	$[X,Y]_{22k}$ k = 1,2,... , n_{22} A_2B_2

Table 1 Research Design

Notes:

X: Student Prior Knowledge Score

Y: Student Task Assessment Score

A1: Student Group Taught by Jigsaw Cooperative Model

A2: Student Group Taught by STAD Cooperative Model

B1: Student Group Assessed by Structured Task Assessment

B2: Student Group Assessed by Portfolio Task Assessment

K: Number of samples

The target population is all students of primary teacher education at Education Faculty in Manado State University which are spread in the second and fourth semester. While those who are affordable populations are students in the second semester because the basic concepts of science subject are in that semester. As it is not possible to experiment with all members of populations, so it is conducted by sample.

The approach used in sampling research of this study is probability sampling. It is sampling techniques that provide equal opportunities for each aspects (member) of the population to be selected as members of the sample. The technique includes simple random sampling, proportionate stratified random sampling, and disproportionate stratified random, sampling area (cluster) sampling (Sugiyono, 2010). Hence, this research used Simple Random Sampling technique. It can be said as simply approach because the taking of sample members from the population is obtained randomly regardless of the strata that exist in that population.

Task Assessment (B)	Cooperative Learning (A)		Total
	Jigsaw (A_1)	STAD (A_2)	
	(X, Y)	(X, Y)	
Structured (B_1)	20 students	20 students	40 students
Portfolio (B_2)	20 students	20 students	40 students
Jumlah	40 students	40 students	80 students

Table 2 Research Design

Notes:

X: Student Prior Knowledge Score

Y: Student Task Assessment Score

The implementation of this research is divided into two learning activities: two independent variables learning and one dependent variable. The first independent variable is Jigsaw and STAD cooperative learning model which role as a treatment variable. The second free variable is task assessment that role as a moderating variable, structured and portfolio task assessment, while the dependent variable is student achievement of science. These learning outcomes are score obtained by students after following the learning outcomes test which is held after finishing the experiment.

Before the implementation of the experiment, it started to do prior knowledge test in the form of tests for all experimental groups. Students' prior knowledge is claimed as covariate variable. After conducting this test, it is followed by the implementation of teaching and learning activities in the four experimental groups. Here the treatment steps as follows:

Task Assessment	**Learning Model**	
	Jigsaw	**STAD**
Structured	1. Teacher make a heterogony group consists of 4 members. 2. Teacher gives a case that relates on diversity of living things in elementary school. 3. Teacher helps students to understand and organize the task that relates to the case. 4. Teacher motivates and maintains each group to spread out in the group who has the same topic. 5. Teacher helps group to discuss and ask some groups to present their result in front of others. 6. Teacher ask the group to turn back to their original groups to explain to others.	1. Teacher tell the aims of the study and give motivation to the students about topic that is given. 2. Teacher make a group consists of 4 members, share the information that is related to the topic. 3. Teacher share the material to the students as well as telling the indicator of the study. 4. Teacher teaches a group who works, observe, and gives support and help. 5. Teacher gives evaluation about the material that has already discussed then let them do presentation about their discussion. 6. Teacher gives a reward to the group.

Task Assessment	**Learning Model**	
	Jigsaw	**STAD**
Portofolio	1. Teacher make a heterogony group consists of 4-5 members. 2. Teacher gives a case that relates on diversity of living things in elementary school. 3. Teacher helps students to understand and organize the task that relates to the case. 4. Teacher motivates and maintains each group to spread out in the group who has the same topic. 5. Teacher helps group to discuss and ask some groups to present their result in front of others. 6. Teacher ask the group to turn back to their original groups to explain to others.	1. Teacher tell the aims of the study and give motivation to the students about topic that is given. 2. Teacher make a group consists of 4 members, share the information that is related to the topic. 3. Teacher organizes and helps the student in a study group. 4. Teacher teaches the groups who works and studies. 5. Teacher gives evaluation about the material that has already discussed then let them do presentation about their discussion. 6. Teacher gives a reward to the group.

Table 3 Treatment Steps of Jigsaw and STAD Cooperative Learning Model

The control that can be done is by checking internal and external validity. The data in this study is 1) data on science learning outcomes and 2) data of students' prior knowledge. The types of science learning outcomes instrument of this study used test instrument in the

form of multiple choices questions and description questions (essay test) developed with reference to the science subject curriculum used in Primary Teacher Education study program of Manado State University. The data obtained will be tested for validity and reliability calculations.

Afterward, to draw conclusion from hypothesis testing that can be accounted for, so data analysis of this research is carried out. Analysis data that are used in this research are descriptive analysis, requirement test analysis, and inferential analysis. These three analyzes are carried out based on students' prior knowledge scores and students' science learning outcomes score after learning and task assessment treatment.

3. Result

Descriptive statistic analysis was conducted to reveal the student learning outcomes of science that was carried by learning model and task assessment as well as students' prior knowledge score. They got their score by filling questionnaire. Here is the recapitulation according to questionnaire result.

A / B		A_1		A_2		Total	
		X	Y	X	Y	X	Y
B_1	N	20	20	20	20	40	40
	Mean	75,75	80,55	68,85	72,00	72,30	76,28
	S	6,28	9,75	5,91	7,79	6,96	9,73
	Min	67	60	57	55	57	55
	Maks	85	98	78	83	85	98
B_2	n	20	20	20	20	40	40
	Mean	67,55	70,40	71,70	75,55	69,63	72,98
	S	5,68	7,99	5,84	10,18	6,06	9,40
	Min	58	52	62	53	58	52
	Maks	80	85	80	90	80	90
Total	n	40	40	40	40	80	80
	Mean	71,65	75,48	70,28	73,78	70,96	74,63

	S	7,22	10,19	5,97	9,12	6,62	9,65
	Min	58	52	57	53	57	52
	Maks	85	98	80	90	85	98

Table 4 Score Recapitulation of Prior Knowledge and Student Achievement to All Groups

Notes:

X: Student Prior Knowledge Score

Y: Student Task Assessment Score

A1: Student Group Taught by Jigsaw Cooperative Model

A2: Student Group Taught by STAD Cooperative Model

B1: Student Group Assessed by Structured Task Assessment

B2: Student Group Assessed by Portfolio Task Assessment

Student learning outcomes of science in a group of students taught by Jigsaw cooperative model showed that 23% student got average score, 55% got more than average score, and 23% got less than average score. Student's prior knowledge taught by Jigsaw cooperative model showed that 38% student got average score, 40% got more than average score, and 23% got less than average score. Student learning outcomes of science in a group of students taught by STAD cooperative model showed that 35% student got average score, 20% got more than average score, and 45% got less than average score. Student's prior knowledge assessed by structured task assessment showed that 38% student got average score, 35% got more than average score, and 28% got less than average score. Student achievement of science in a group of students assessed by portfolio task showed that 35% student got average score, 23% got more than average score, and 43% got less than average score.

Student's prior knowledge assessed by portfolio task assessment showed that 30% student got average score, 28% got more than average score, and 43% got less than average score. Student achievement of science in a group of students assessed by structured task and taught by Jigsaw cooperative model showed that 35% student got average score, 40% got more than average score, and 25% got less than average score. However, student's prior knowledge assessed by structured task assessment and taught by Jigsaw cooperative model showed that 15% student got average score, 45% got more than average score, and 40% got

less than average score. Student achievement of science in a group of students assessed by structured task and taught by STAD cooperative model showed that 30% student got average score, 50% got more than average score, and 20% got less than average score. However, student's prior knowledge assessed by structured task assessment and taught by STAD cooperative model showed that 35% student got average score, 30% got more than average score, and 35% got less than average score.

Student achievement of science in a group of students assessed by portfolio task and taught by Jigsaw cooperative model showed that 25% student got average score, 45% got more than average score, and 30% got less than average score. Besides that, student's prior knowledge assessed by portfolio task assessment and taught by Jigsaw cooperative model showed that 50% student got average score, 15% got more than average score, and 35% got less than average score. However, student achievement of science in a group of students assessed by portfolio task and taught by STAD cooperative model showed that 50% student got average score, 15% got more than average score, and 35% got less than average score. Then, student's prior knowledge assessed by portfolio task assessment and taught by STAD cooperative model showed that 35% student got average score, 40% got more than average score, and 25% got less than average score.

Those test results of analysis requirement based on normality test used Lilliefors and homogeneity various test used *Microsoft Excel*. According to normality test, all research data is got from population that distributed normally. While, homogeneity various test revealed that students who taught by Jigsaw cooperative model and STAD have the same variant (homogeny). It was also happened on students who assessed by structured and portfolio test (homogeny).

4. Discussion and Recommendation

According to the result, the main factor of learning science is cooperative learning model and task assessment. Learning model and task assessment is developed because that is an important alternative way to improve student achievement of science in primary teacher education. Because of that, Jigsaw cooperative learning model can be used on developing student achievement of science and task assessment by further research.

As a feedback, there are some implications; (1) it supposed to gain probability science material by giving Jigsaw cooperative learning model topics to improve student achievement

of science in primary teacher education, so that academics can create habit for the students to make a study group or by helping each other as a tutor. Cooperative learning model is suitable for students of teacher of elementary school because it has various backgrounds, (2) science learning and structured task assessment is necessary to used and developed more by academics because indifferent knowledge of students' ability can improve their knowledge by literature study or manual. Furthermore, the effect of prior knowledge reflected the enrich knowledge, (3) to improve the student achievement of science in primary teacher education can be conducted by using Jigsaw cooperative learning model and structured task assessment in science learning. It can improve either the learning process or student learning outcomes of science. Combination of both would increase the knowledge and confident of the students. It is because not only improve the socialization skill, but also create the scientific attitude, self-control, and respect others, and (4) it is needed to conduct further research for combining any kind of cooperative learning models and structured task in primary teacher education learning science.

5. Conclusion

The linier effect of prior knowledge against student learning outcomes of science does not have significant difference between four groups of students formed by learning model and intelligence. Thus, based on the result, it can be concluded that; (1) student's group learning outcomes of science taught by Jigsaw cooperative learning model is higher than STAD cooperative learning model after controlling the prior knowledge of student, (2) student's group learning outcomes of science assessed by structured task is higher than portfolio task, after controlling the effect of prior knowledge, (3) there is an interaction effect between cooperative learning model and task assessment toward student learning outcomes of science after controlling science prior knowledge, (4) groups taught by Jigsaw cooperative learning model and assessed by structured task is higher than portfolio task, (5) groups taught by STAD cooperative learning model and assessed by portfolio task is higher than structured task, (6) student learning outcomes of groups assessed by structured task and taught by Jigsaw cooperative learning model is higher than STAD cooperative learning model, (7) student learning outcomes of groups assessed by portfolio task and taught by STAD cooperative learning model is higher than Jigsaw cooperative learning model.

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