Wordwall-Assisted TGT Learning Models in The Solar System Materials: It's Impact on Improving Student's Concept Understanding

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ABSTRACT

The purpose of this study was to evaluate the impact of using the Teams Games Tournament (TGT) cooperative learning model on the conceptual understanding of seventh-grade junior high school students. Experimental research with a quasi-experimental design "Nonequivalent control group design" and the research model "Posttest only control group design" is the methodology that will be used. The data collection tool was in the form of a test on the results of understanding the class VII concept of the Solar System material which consisted of 21 multiple choice questions. Descriptive analysis will be carried out with students' conceptual knowledge, and inferential analysis will be carried out with the normality test, homogeneity test, and hypothesis testing using SPSS version 22. After the analysis is carried out, it is known that the average understanding of the concept of the experimental group is 61.10 which is included in the high category, while the mean -the average control group's understanding of the concept of 53.33 is in the sufficient category. The difference in average understanding of concepts between the experimental group and the control group using the wordwall-assisted TGT cooperative learning model is statistically significant. The conclusion from the research: Compared to conventional learning, using the TGT cooperative learning methodology is effective in increasing students' conceptual understanding of the Solar System material.

Keywords: *cooperative learning model, Teams Games Tournament* (TGT)*, concept understanding, wordwall, solar system*

INTRODUCTION

It has been agreed that education has become one of the most important factors that support the progress of a country. This is due to the education can improve the quality of human resources in the country. According to Darmaningtyas, education is a conscious and systematic effort aimed at raising a person's standard of living. In essence, education is aimed at making the life of a person or group better than before (Suhardin, 2021). In addition, science is a branch of science that is studied at all levels of education, including junior high school. Furthermore, Physics is considered as an prominent component in achieving pedagogical goals that support scientific and technological progress, as well as the idea of coexisting in harmony with nature. (Arimi, 2020).

Science including physics consists of 3 parts, namely process aspects, knowledge aspects, and attitude aspects. Students are required to be able and skilled in the cognitive and psychomotor domains as well as being able to think systematically, objectively, and creatively.

Learning Physics has the goal of improving students' thinking skills (Lukman, 2020). Various factors lead to low science learning outcomes for Indonesian students, including student interests, characteristics of children in their families, learning motivation, reading ability, self-concept, learning methodology, level of attendance, and sense of belonging (Wisudawati, 2014).

Based on evaluation of the 2018 Program for International Student Assessment (PISA) from the Organization for Economic Co-operation and Development (OECD) revealed that the quality of Indonesian education is still below standard. Even more, All PISA indicators in Indonesia have decreased in recent years. Scientific indicators fell from position 62 in 2015 to position 71 (Eka, 2021). In addition, the latest research findings regarding students' absorption of solar system material seen from the SMP National Examination in Pekanbaru City are included in the low group which can be seen in Table 1.

Table 1. The Material Absorption Capacity of the Solar System in 2017, 2018, and 2019 in the National Examination (Puspendik. 2017, 2018, 2019)

School Year	County Town Pekanbaru	Riau Province	Nasional
2016 s.d. 2017	46.09	44.11	47.35
2017 s.d. 2018	46.43	45.35	45.86
2018 s.d. 2019	60.52	52.0	53.04

According to a preliminary survey of student's perceptions of learning science conducted by 47 students at SMP Muhammadiyah 1 Pekanbaru, 61.7% of respondents stated that learning science was difficult, meaning that 61.7% of respondents thought learning science was included in the difficult category. The survey results show that 70.2% of teachers still teach students using lecture techniques and respondents will also choose media that is often used by teachers. 59.6% of respondents chose pictures as a medium that teachers often use when teaching, 21.3% of respondents chose worksheets, 17% of respondents chose teaching aids, and 2.1% of respondents chose practice questions. According to the teachers, material about the solar system is a theory that is difficult for children to understand.

In order to increase students' understanding of solar system material, teachers need to consider alternatives that are relevant and more constructive than conventional teaching methods. According to the philosophy of constructivism, individuals build their knowledge based on the experiences of others or the knowledge they already have. Constructivism theory does not try to understand reality, but wants to understand a process that occurs in learning, from not knowing to knowing something. Therefore, learning is a process that actively involves students to create meaning, physical experience, and other things (Mardiana, 2018). Classroom activities should be structured so that students can debate and explore difficult concepts during learning. Teaching like this can help students understand the subject matter, care about one another, and be responsible for themselves (Nurhadi, 2019).

Physics lessons are considered almost as unitary lesson that memorizes formulas, so teachers must be able to involve students and design an interesting learning environment to increase their understanding of the concepts being taught. the types of models that can be used during learning in creating these situations use a type of cooperative model, namely Teams Games Tournament (TGT) (Gunarta, 2018).

Cooperative learning is a teaching technique that requires students to work together to achieve common goals (Harefa, 2022). According to Wina Sanjaya, there are four key components of cooperative learning: (1) group members; (2) achievable goals; (3) individual learning efforts for each member; and (4) group rules (Lukman, 2020). When using the TGT model, students create and organize information for themselves. The goal is to achieve subject mastery which includes study skills and group collaboration. This teamwork is the hallmark of

TGT learning. TGT learning makes learning more comfortable for children and encourages a sense of responsibility, teamwork, healthy competition, and involvement in the learning process (Mahardi, 2019).

The use of the TGT model will be even more interesting if it uses the help of learning media. Wordwall is a learning medium that is used when TGT is implemented. The use of this media can involve students to be creative and enhance group study sessions. A digital game website called wordwall offers a selection of games and tests that teachers can use to assess student understanding of the material. In 2012 Visual Education Ltd, a company located in England created this program. This program can be used by teachers who want to use learning assessment techniques. Wordwall also supports various games and embedding code on various social media platforms (Khairunnisa, 2021).

Media wordwall has several unique features, such as quizzes, matching, word search, word shuffling, and more. Teachers can easily access and use this program because it can be accessed via the web. Users who are just starting with this web application can use their creation from the examples provided on the wordwall page. This makes it easy for new users to use wordwalls in classroom teaching in creative and innovative ways (Mujahidin, 2021). By using wordwall media, it is hoped that students can increase their understanding of concepts in the solar system material. The use of wordwall media is considered very effective in increasing students' understanding of the concept of the solar system.

Understanding concepts is an urgent issue for students to master when studying Physics because good conceptual knowledge will get good academic success and vice versa (Ulfia, 2019). Subsequent concepts will be easier for students to acquire after they have a strong understanding of the previous material. Students' conceptual integrity can also contribute to the formation of a cohesive scientific framework. Students then use scientific frameworks for various challenges faced in everyday life (Putri, 2020).

According to Bloom's theory, conceptual understanding is the ability to understand meaning as an expression of information presented in a way that is simple to understand, interpret, and apply. Students must be able to connect one idea with another to understand concepts, students cannot only rely on what they already know (Nurlili, 2021). Astuti suggests seven indicators of Bloom-based conceptual knowledge, including: (1) Repeating a concept; (2) Arranging objects into categories based on their characteristics or conceptual meaning; (3) Be able to distinguish the concept of examples and non-examples; (4) Elaborate ideas through some visual representations; (5) Provide a sufficient definition for a concept; (6) Selecting, using, and utilizing certain techniques or operations; (7) Applying concepts in solving problems (Deliany, 2019).

The findings of Rohmah's 2016 research show that the application of the TGT learning model, which is a type of cooperative model with the help of online game learning media, has an impact on students' understanding of mathematical concepts and reasoning. Abdillah (2018) in his research used the type of cooperative learning model used was the TGT type learning model with the help of question card learning media. In Abdillah's research, it can be said that it is useful in improving student learning outcomes because there are changes in student learning outcomes after using this model. According to Rosidin (2019), the use of the TGT learning model with ludo media has an impact on students' mathematical understanding. Based on the introduction that has been explained, the researchers conducted research on Wordwall-Assisted TGT Learning Models in Solar System Materials: Its Impact on Increasing Student's Concept Understanding.

METHODOLOGY

An experimental method will be used in this study. Sugiyono defines experimental research as research conducted under controlled conditions to determine the impact of certain treatments on other individuals (Prina, 2015). By using the TGT learning model and wordwall educational game media, this study aims to determine students' conceptual knowledge.

The type of quasi-experimental design that will be used is the Nonequivalent Control Group Design with the Posttest Only Control Groups Design model, having a control group and an experimental group that is not randomly selected (Rohman, 2015). The research design is shown in Table 2.

Table 2. Research Design Nonequivalent Control Group Design

Groups	Treatment	Posttest
Experiment	X_1	O_1
Control	X_2	O_2

The experimental group was given treatment (X_1) in the form of learning using the TGT model. During the learning process, participants will follow the learning implementation plan and use experimental group learning media in the form of textbooks, student worksheets, wordwalls, and other media that support learning. In addition, the control group was given treatment (X_2) in the form of conventional learning that applies at school. When the learning takes place they will follow the learning implementation plan, and use control group learning media in the form of textbooks and student worksheets. After learning using the TGT and conventional cooperative models has been carried out, a posttest (O_1 and O_2) will then be carried out in the two groups.

This research was carried out in the 2021-2022 academic year at SMP Muhammadiyah 1 Pekanbaru. All class VII students of SMP Muhammadiyah 1 Pekanbaru for the 2021-2022 school year totaling 168 students are the population of this study. The sample for this study was 56 participants, with 29 students from class VII.4 as the experimental group and 27 students from class VII.5 as the control group.

The research data collection method is to give tests to the experimental group and the control group after being given treatment in both groups. There are 21 multiple choice questions on the concept comprehension test, all of which fall under the C_2 cognitive domain. One indicator of understanding the concept will represent 3 questions sequentially. The test questions are prepared based on indicators of understanding the concept and refer to the syllabus for science subjects for class VII KD 3.11.

In getting a broad picture of how well students understand the concept a descriptive analysis will be carried out by comparing the results of the values obtained with the maximum value determined by the equation (Arimi, 2020):

$$\text{Concept understanding} = \frac{\sum gain\ score}{\sum max\ score} \times 100\% \dotfill (1)$$

Table 3. Categories of Concept Understanding Values (Febriyana, 2021)

Understanding Value (%)	Category
$80 < PK \leq 100$	Very high
$60 < PK \leq 80$	High
$40 < PK \leq 60$	Enough
$20 < PK \leq 40$	Low
$0 < PK \leq 20$	Very low

This study uses inferential analysis to find out how the wordwall-assisted TGT model and the conventional model affect students' conceptual knowledge during learning. This analysis uses three tests using SPSS version 22. Normality test with the Kolmogorov-Smirnov approach to find out whether the sample data comes from samples that are normally distributed or not (Jeheman, 2019). Posttest results of students' understanding of the Solar System curriculum for class VII are the data being tested.

To find out that the two samples have a homogeneous variant, the homogeneity test is used with the Levene method (Ningsih, 2017). Posttest results of students' understanding of the Solar System curriculum for class VII are the data being tested. To verify the accuracy of the data collected from the research sample, hypothesis testing will be used. The independent sample t-test method is used in hypothesis testing. The results of the posttest understanding of the Solar System material for class VII students in both the control and experimental groups were used as the data source for this t-test.

RESULT AND DISCUSSION

After being given treatment in class VII.4 and class VII.5, data on understanding the concept was obtained from the results of the posttest. Equation 1.1 is used to test student learning outcomes on the Solar System material, and the findings of a descriptive analysis based on students' conceptual knowledge can be seen in Table 4.

Table 4. The Average Understanding of Students' Concepts

Interval (%)	Category	Frequency (%)	
		Experiment Group	**Control Group**
$80 < PK \leq 100$	Very high	10.3	3.70
$60 < PK \leq 80$	High	48.28	25.93
$40 < PK \leq 60$	Enough	31.03	55.56
$20 < PK \leq 40$	Low	10.34	14.81
$0 \leq PK \leq 20$	Very low	0.00	0.00
Average Understanding of Concepts		61.10	53.33
Concept Understanding Category		High	Enough

Based on table 4., it can be seen that Students' understanding of concepts in the experimental group was in the high category, while in the control group, it was in the sufficient category. Student understanding of concepts averaged 61.10% in the experimental group using the wordwall-assisted TGT cooperative approach, compared to 53.33% in the control group using conventional learning. Thus it can be said that learning with the TGT model and wordwall media can help students develop their conceptual understanding of information related to the Solar System material.

The results of the comparison of the percentage of students who understood the concept between the two groups showed that the experimental group's understanding of the concept was higher. This is in accordance with research conducted by Rosidin (2019). The results of the study show that the TGT learning model which is equipped with the Ludo learning media has an impact on the mathematical understanding abilities of class VIII students of MTs N 1 Bandar Lampung and is in line with research conducted by Rahayu (2022) which found that using the TGT model combined with media depicting snakes Stairs can increase students' knowledge of

the subjects being taught. The results of a comparative analysis of students' conceptual understanding of each problem on the Solar System material from the two groups can be seen in Figure 1.
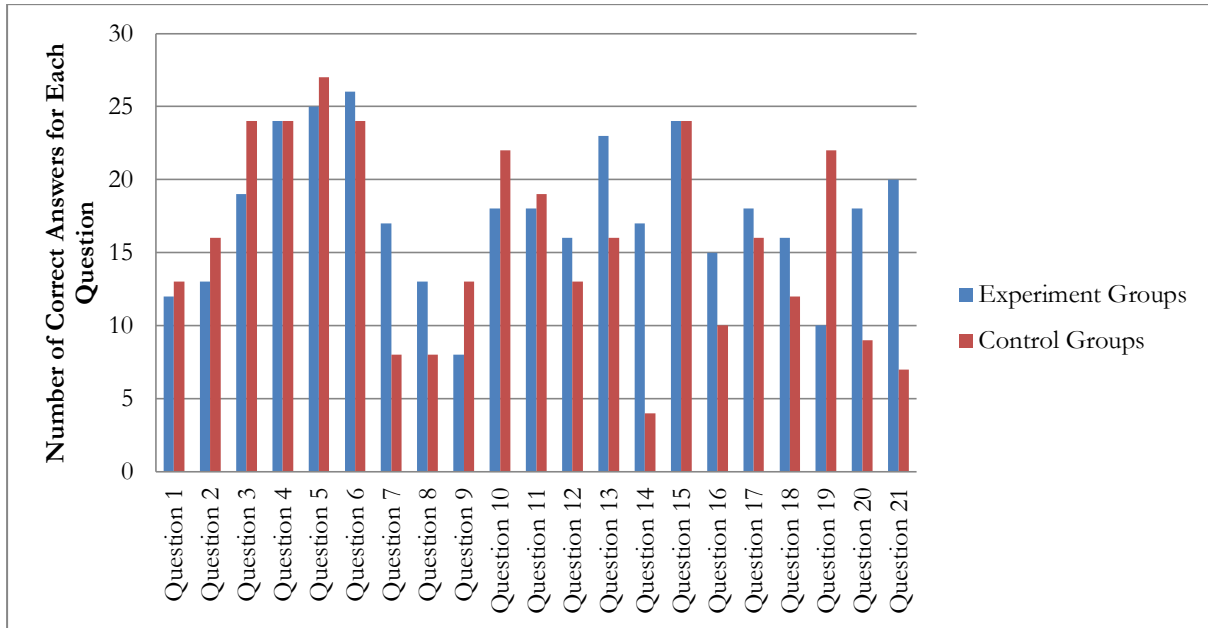

Figure 1. Graph of Comparison of Students' Understanding of The Two Groups' Concepts on Each Question

Figure 1. shows that the control group is superior to the experimental group in questions 1, 2, and 3. Question 1, question 2, and question 3 are part of the indicator of understanding the concept, namely "repeating the concept". Learning in the control group was centered on the teacher, thus encouraging students to memorize and repeat what the teacher said. The control group answered questions 9, 10, and 19 well. Questions 9, 10, and 19 are questions related to the revolution and rotation of the moon. The control group answered the questions more accurately than the experimental group because they memorized information about the moon's rotation and revolution. The two groups have different levels of conceptual knowledge for each indicator. Figure 2. shows the percentage of students in the experimental group and the control group who understand each indicator.
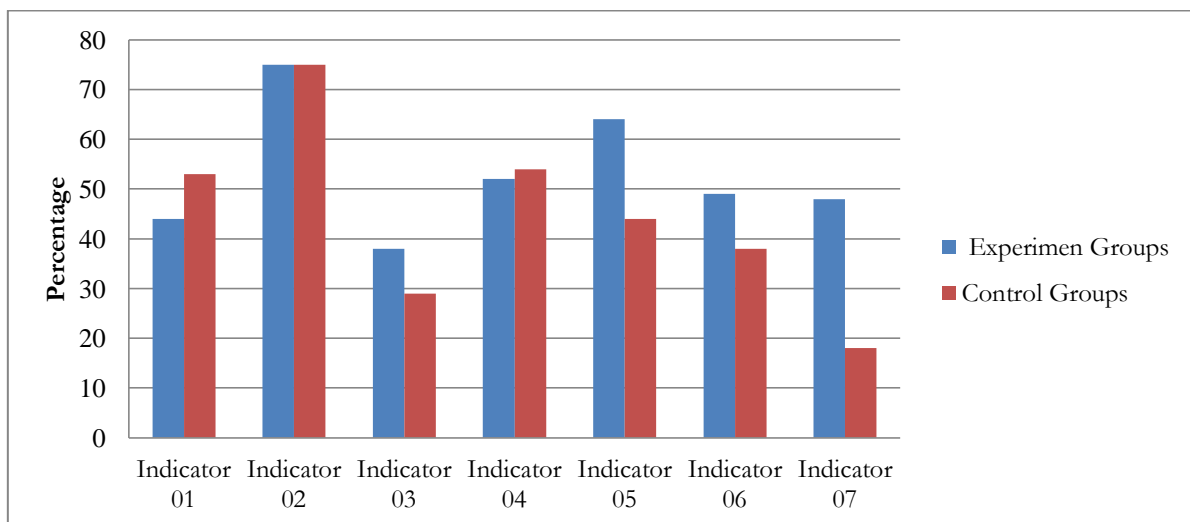

Figure 2. Graph of Comparison of The Percentage of Students' Understanding of Concepts in The Two Groups for Each Indicator

The experimental group has a higher proportion of conceptual understanding than the control group. Indicators 03, 05, 06, and 07 show the experimental group is superior, while indicators 01 and 04 show the control group is superior. The experimental group performed better on indicator 3. Students' errors in correctly recognizing events caused by the rotation and revolution of the earth and moon were the cause. According to Erlinda's research, students in the experimental group were better able to distinguish examples from non-examples compared to the superior control group with a score of 9 (Erlinda, 2017). Because the experimental group is better at providing sufficient definitions for a concept, it performs better on indicator 5.

The experimental group performed better than the control group on indicator 06 in implementing, using, and selecting solutions to solve problems. According to Gunarta's research, involving students actively in the learning process will encourage them to provide an overview of learning, be able to discuss, describe, and analyze the concepts being taught, then be able to integrate them with the concepts they already know. This can improve learning outcomes, especially in science learning (Gunarta, 2018).

At indicator 07, the experimental group outperformed the control group. This is because the experimental group students are more prepared than the control group students to apply concepts and approaches in solving problems that arise in everyday life. During the lesson, the experimental group held competitions and gave explanations about the phenomena caused by the rotation and revolution of the earth and moon, while the control group only got a cursory explanation and worked on student worksheets.

To find out the effectiveness of the wordwall-assisted TGT cooperative learning model on Solar System material in increasing students' understanding of SMP Muhammadiyah 1 Pekanbaru which aims to be a reference for making final research decisions, an inferential analysis will be carried out using the SPSS version 22. Normality tests and homogeneity tests will be carried out first, then tested the hypothesis. Table 5. displays the results of the homogeneity test, normality test, and hypothesis testing.

Table 5. Results of Normality Test, Homogeneity Test, and Hypothesis Test

Types of Inferential Analysis	Group	Significance	Decision
Normality Test	Experiment	0.200	Data is normally distributed
	Control	0.200	Data is normally distributed
Homogeneity Test	Experiment, Control	0.864	Homogeneous variant
Hypothesis Test	Experiment, Control	0.32	H_0 is rejected, there is a significant difference

The normality test in this study yielded a significance value of 0.200 for both groups. According to the decision-making criteria, if $p > 0.05$ the data is normally distributed, then 0.200 > 0.05 the test data for both groups is normally distributed. In addition, a homogeneity test will be carried out to find out whether the variance and average scores of the data are uniformly distributed. At a significance level of 0.864 for the homogeneity test, it can be concluded that the two groups are homogeneous or have the same variance. After the homogeneity and normality tests were completed, a hypothesis test was carried out. The significant result (sig.2-tailed) is 0.032. According to the rules, H_0 is rejected if the significance is less than 0.05, which means that there is a significant difference in the average value of the two groups' understanding of the concept, where the experimental group outperforms the control group in the Solar System material.

The results of the study in the form of descriptive and inferential analysis showed that there was a significant difference between the average test scores of the two groups in terms of

students' understanding of concepts, where the experimental group was superior to the control group. At SMP Muhammadiyah 1 Pekanbaru it was found that the wordwall-assisted TGT learning model could increase students' conceptual understanding of the solar system material. Ulfia's study shows that the TGT model can help students become independent and active students, both individually and in groups because it provides an opportunity for them to build arguments that are in line with the perspectives they have built (Ulfia, 2019).

The wordwall-assisted TGT cooperative learning technique has benefits in preparing children to interact with others regardless of intelligence, language, or ethnic variations. Students with high academic abilities also stand out in learning thanks to the TGT cooperative learning approach, while students with low academic abilities also actively participate and play an important role in their groups. Students are more happy and excited when the TGT cooperative model is used with wordwall media because there are game activities during the tournament, students receive group awards, and students can use this wordwall media to practice questions. The use of the TGT model has the advantage of allowing students to freely engage and share their opinions, which promotes a better understanding of the subject matter (Rahmat, 2018). The TGT learning model fosters interpersonal cooperation (both verbal and nonverbal), reduces competitiveness, and fosters students' thoughts and beliefs that performance determines results and not luck (Sohimin, 2014).

Although the research has been successfully carried out and achieved satisfactory results, there are still various obstacles in its implementation. For example, organizing a tournament takes a long time because you have to change the shape of the chairs. Each group consists of 4 students with a total group of 7 students, during the tournament each group representative sits at table 1 to table 4, 1 table contains 7 people who are representatives of each group. When changing the shape of the chair before holding a class tournament, conditions are often not conducive. Smartphones are needed when wordwall media is used during a tournament. Unfortunately, some students do not have smartphones, so that during the tournament students wait for their friends to finish working on questions on the wordwall to borrow smartphones, and the tournament does not take place simultaneously for all students.

CONCLUSION

Based on the results of the study, the wordwall-assisted TGT learning approach succeeded in increasing students' conceptual understanding of the Solar System material when compared to using conventional learning models. Students who use the wordwall-assisted TGT model have a high conceptual understanding compared to students who use traditional learning whose conceptual understanding is only sufficient. The results obtained (sig, 2-tailed) $0.032 < 0.05$ H0 was rejected, indicating that there was a significant difference between the two groups in terms of the average value of students' understanding of concepts. The results of this study can be used to guide further research on related topics to measure students' conceptual understanding abilities. It is suggested that the teacher considers the selection of appropriate teaching materials to group the concepts that will be associated when using the TGT model and wordwall media. Learning that uses mathematics is not recommended to use wordwall media.

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