

TGT Type Cooperative Learning Assisted by Quizizz: Study of Students' Physics Cognitive Abilities on the Material of Motion of Objects

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Abstract: This study aims to analyze the effect of the TGT type cooperative learning model assisted by the quizizz application in improving students' physics cognitive abilities in the material of motion of objects. The type of research used in this study is a quantitative descriptive research type. The design used in this study is the One-Group Pretest-Posttest Design. The subjects in this study were 23 people. The data for this study were collected through test and non-test instruments, the test instrument was in the form of an initial test and a final test, while the non-test instrument was in the form of student worksheets and tournament results. The results of the study showed that the initial abilities of students before being taught using the TGT type cooperative learning model assisted by the quizizz application were proven to be in the failing qualification with an achievement score of 24.08. The cognitive abilities of students during the learning process assessed in the LKPD and tournament obtained completeness from all groups that were in the sufficient qualification with an average value of 74.37. The average score of the final test achievement of students was 81.17 where 1 student was in very good qualification, 10 students were in good qualification and 12 other students were in sufficient qualification. Meanwhile, the results of the analysis of the increase in students' cognitive abilities in the N-gain test obtained a value of >0.74. This result was obtained because of the treatment given, with the TGT type cooperative learning model assisted by the quizizz application. Thus it can be concluded that through the use of the TGT type cooperative learning model assisted by the quizizz application in physics learning is complete on the material of motion in objects.

Keywords: Cognitive ability; Cooperative TGT; Physics learning; Motion of objects

Introduction

The idea of children working together for educational purposes is not new. As early as the first century, Quintilian argued that students could benefit from teaching each other. They believed that students would benefit from teaching and being taught by other students. In late eighteenth-century England, Joseph Lancaster and Andrew Bell made extensive use of cooperative groups of students, and the idea appears to have been first experimented with in the United States when the Lancastian School opened in New York City in 1806. In recent years, the idea of children working together in teaching or problem-solving groups of two or more has enjoyed a revival in the United States.

Because student teachers can provide teaching assistance at no extra cost, part of the recent interest in cooperative groups has undoubtedly been driven by problems of tight school budgets and crowded classrooms. However, a more positive stimulus for this new experimentation has come from the belief that group teaching and problem-solving can offer significant benefits to students (Wodarski & Feit, 2011).

A good way of educating can determine the success of education, seen from the teaching and learning activities that need to be made interesting so that students can receive the material given by the teacher well (Leasa, 2024). The main problem in learning in schools today is the low absorption of students towards learning materials. This also occurs in physics learning

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(Batlolona, 2024). The primary goal of physics education is to identify potential and actual barriers to student learning, and then to address those barriers in ways that lead to more effective learning (Meltzer, 2002). Reports from external examiners and personal experience as a classroom teacher indicate that physics students lack some of the essential prerequisite knowledge, skills, and techniques needed to learn and understand concepts in physics. Among these prerequisites are mathematical skills, language skills, and basic terminology in physics. These areas have not received the attention they deserve from physics education researchers (Ojediran et al., 2014). Therefore, it is necessary to use an interesting learning model or method so that students can receive lessons well and ultimately improve their learning outcomes, one of the models that can be used is the cooperative learning model of the teams game tournament (TGT) type.

The TGT type cooperative learning model is a learning model that can be used to improve student learning outcomes, where learning activities provide opportunities for...groups to compete with other groups so that it can increase the activeness and motivation of students to learn. The Teams-Games-Tournaments (TGT) program involves a unique approach to prevention that combines peer support and teaching with a group reward structure that reinforces healthy behaviors. The TGT learning model will facilitate students to learn how to build their own knowledge and socialize with their friends through teamwork because TGT is a learning model that is rooted in cooperative learning (Astri, 2018). TGT uses three methods: (1) games as a teaching tool; (2) small groups of 8 students as the class work unit; and (3) task and reward structures used in a traditional classroom environment. TGT focuses on group achievement rather than individual achievement to study adolescent problem behavior (McNeece & Thyer, 2005). In addition, TGT cooperative learning also creates an active learning environment in completing exercises, and discussions between students and teachers (Veloo & Chairhany, 2013).

Efforts to improve the learning process can be done by preparing students mentally and preparing the required instruments, in addition it is necessary to increase the resources of educators or teachers in managing learning, especially in the era of the industrial revolution 4.0 which requires teachers and students to increase individual capacity significantly and comprehensively through various efficiencies in the world of education such as utilizing technology in the learning process (Abednego, 2023). The motivation for conducting this study came from the home-based learning (HBL) period since the beginning of the Movement Control Order (MCO) due to COVID-19 in 2020. The researchers saw an increase in the use of

Quizizz among teachers, and questioned whether the platform was effective in improving students' academic performance and their knowledge development. Teachers' perceptions were predictable but a review of articles based on Quizizz usage turned out to be an effective method to truly understand teachers' perceptions of the online learning platform (Lim & Yunus, 2021).

Games are one of children's favorite activities, especially for elementary school students. Introducing games into the classroom can transform an ordinary language phenomenon into a lively and interesting teaching method that students want to experience (Vrcelj et al., 2023). As a result, students' future English learning and teaching practices will be influenced to varying degrees by the internal and external motivations fostered through gamif-based formative assessment. Of course, it is important to provide students with opportunities to test their knowledge before conducting a comprehensive evaluation. As one of the online formative assessment tools, Quizizz is widely recognized by academics as a means to improve student learning outcomes (Zhorova et al., 2022). Teachers can educate students effectively and inspire them to place importance on exam goals with the help of Quizizz to increase their motivation (Zhang & Crawford, 2024).

Various IT-based multimedia facilities can be utilized to make the learning process more interesting, both online and offline (Ealy, 2018). Various applications that can be used include Google Classroom, Google Meet, Edmodo, watching video materials from teachers, WhatsApp and various question applications such as Quipper, Quizlet, and Quizizz. Quizizz is an educational game application that is narrative and flexible, in addition to being used as a means of delivering material, Quizizz can also be used as an interesting and fun learning evaluation media. With the existence of the Quizizz games based learning application, it is expected to help learning activities in the classroom, increase students' knowledge skills and as an alternative to improving learning in the classroom to be more meaningful (Orhan Göksün & Gürsoy, 2019). Quizizz is an application that can be used to create interactive multi-game quizzes that can be used via electronic devices such as computers, smartphones, and tablets to complete the quiz. Proving that student learning outcomes increase because assessments using Quizizz are very interesting and fun so that students are motivated by learning materials. One of the important points for successfully implementing a flipped classroom is ensuring that all students have the same understanding of the initial information at the beginning of class (Leasa & Pelamonia, 2024). One way to achieve this is by administering online quizzes, and there are many benefits to this approach in general, including

convenience and flexibility when compared to paper quizzes, as well as the ability to provide students with immediate instruction and feedback. In theory, administering standardized quizzes to all students on the topic at hand ensures that a consistent minimum level of knowledge is achieved before moving on to the more cognitively challenging tasks that will be given in class (Craigie, 2023) Therefore, this study aims to analyze the effect of the TGT type cooperative learning model assisted by the Quizizz application in improving students' physics cognitive abilities in the material of motion of objects.

Method

Research Design

The type of research used in this study is a quantitative descriptive research type with a cooperative learning model of the teams game tournament (TGT) type assisted by the Quizizz application to describe how to understand the concept of the material on motion in objects.. The design used in this study is One-Group Pretest-Posttest Design(Harris et al., 2004) can be seen below.



Information

- O_1 : Level of understanding of learning material before treatment (pre-test)
- X : Providing treatment to students, namely learning using the TGT learning model assisted by the Quizizz application to improve student cognitive skills.
- O_2 : level of student understanding of learning material after treatment (Post-test)

Participant

The subjects in this study were class 8-2 of SMP Negeri 8 Ambon, totaling 23, with the sampling technique being random sampling, because all class 8 students' abilities in the science subject (physics) were the same.

Research Instruments

The instruments in this study are Test Instruments in the form of multiple choice questions and Objective descriptions, as well as Non-test instruments in the form of LKPD and Tournaments using the quizizz application in this case to measure students' abilities after learning using the TGT type cooperative model with the help of the quizizz application.

Data Analysis Techniques

Data analysis in this study was carried out using quantitative descriptive analysis to describe the data as

it is in the form of percentages and explain the data or events with qualitative explanatory sentences. Furthermore, the achievement scores for the initial test results, formative tests, and the average achievement scores for cognitive aspects are ranked based on the data in Table 1.

Table 1. Assessment qualification references

Achievement Level	Qualification
90-100	Very good
80-89	Good
70-79	Enough
<70	Lack/failure

Analysis of cognitive ability improvement to be able to see the improvement in conceptual understanding, it can be analyzed using the gain value. Gain is the difference between the pre-test and post-test values. The gain scores obtained are then categorized in Table 2.

Table 2. N-Gain Categories

Gain score	Category
$g \geq 0.7$	Tall
$0.3 \leq g < .7$	Currently
$g < 0.3$	Low

Source: (Hake, 1998)

Result and Discussion

The following presents the cognitive abilities of 8th grade students at SMP Negeri 8 Ambon before, during, and after the learning process and also its improvement.

Initial Cognitive Abilities of Students Before Being Taught Using the TGT Type Cooperative Learning Model.

Based on the results of the study, the initial cognitive abilities of students without using the TGT type Cooperative Learning Model assisted by the Quizizz application illustrate that students have not completed learning on the material of object motion. On average, students get scores below the KKM, and the achievement scores of students before learning and their qualifications can be seen in Table 3.

Table 3. Qualification of students' initial test achievement scores

Achievement Score Interval	Frequency	Percentage (%)	Qualification
90 - 100	-	-	Very good
80 - 89	-	-	Good
70 - 79	-	-	Enough
≤ 69	23	100	Lack/Failure
Average Student Achievement Score = 24.08			Fail

Based on the data in Table 3, it can be seen that the students' abilities in the material of object motion before being taught with the help of the quizziz application in the TGT cooperative model, it can be seen that 23 (100%) students are in the failed qualification. Thus, it can be said that the completeness of individual student learning

has not been achieved, this can be seen from the average initial test score of students which is 24.08. Referring to the existing minimum completeness criteria (KKM) which is 70. The classification of individual students' initial abilities can be seen in Figure 1.

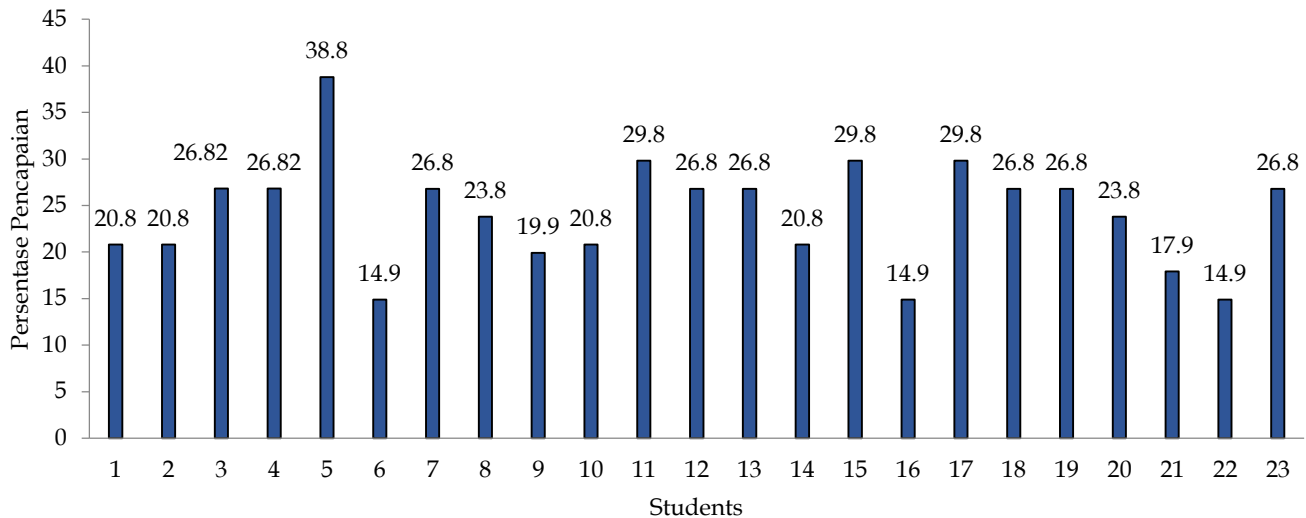


Figure 1. Initial abilities of students

Based on Figure 1, it can be seen that the initial abilities of students are in the failure classification with the lowest student achievement score being 14.9 and the highest being 38.8.

Cognitive Abilities of Students During the Learning Process Using the TGT Type Cooperative Model

Based on the research results, the cognitive abilities

of students during the learning process using the Quizizz application with the TGT type cooperative model are described in the percentage value of the work results of LKPD I, LKPD II and tournament results. The average score data for cognitive abilities during the learning process is sufficient. The average qualification of student achievement scores in cognitive abilities can be seen in Table 4.

Table 4. Qualification of cognitive ability achievement scores during the process

Achievement Score Interval	Worksheet		Tournament presentation		Qualification
	Frequency	Percentage	Frequency	percentage	
90-100	-	-	1	4.34	Very good
80-89	23	100	1	4.34	Good
70-79	-	-	11	47.82	Enough
60-69	-	-	10	43.47	Not enough
≤ 59	-	-	-	-	Fail
	Average Score LKPD Achievement= 83.10		Average tournament achievement score = 67.39		Enough

average total cognitive ability score during the process = 75.24

Based on the data in Table 5, it can be seen that the results of the achievement of cognitive abilities obtained during the learning process using the TGT type cooperative learning model at meetings I to II. It can be seen that 2 (8.6%) students have good learning outcomes

and 21 (91.4%) are in sufficient qualifications, and the average score of cognitive ability achievement is 75.27 in sufficient qualifications. The qualifications of students' cognitive abilities at meetings I to II of individuals can be seen in Figure 5.

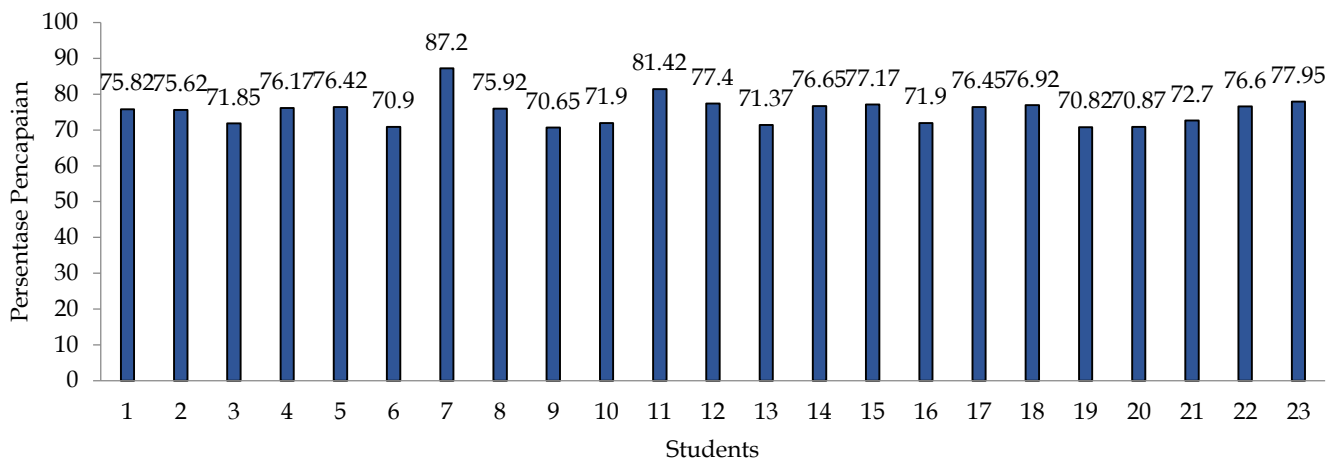


Figure 2. Achievement scores during the process

Based on Figure 2, it shows the average achievement score during the process obtained by each student in cognitive abilities on average cognitive abilities, where it can be seen that each student has different abilities, the highest score obtained by students is 87.2 and the lowest is 70.65, but overall it can be seen that all students succeeded in achieving completion.

Final Ability of Students After Being Taught the TGT Model Assisted by the Quizizz Application

Based on the research results, the final ability test is used to measure the level of success of students after carrying out the learning process in the classroom. The learning process in the classroom using the TGT learning model using the quizizz application can improve students' cognitive abilities which are measured when conducting the final test, where the total number of students who took the final test was 23 students. can be seen in Appendix 14 while the achievement score qualifications can be seen in Table 5.

Table 5. Qualification of final test achievement scores for students

Achievement Score Interval	Frequency	Percentage (%)	Qualification
90-100	2	8.7	Very good
80-89	12	52.2	Good
70-79	9	39.1	Enough
≤ 69	-	-	Fail
Average Student Achievement Score =			Good
81.27			

Based on the data in Table 5. it can be seen that after using the TGT type cooperative learning model assisted by the Quizizz application in the learning process, 2 (8.7%) students were in very good qualifications, 12 (52.2%) students were in good qualifications, and 9 (39.1%) students were in sufficient quality. Referring to the existing KKM, which is 70, it can be stated that the average results of the final test scores of all students are in good qualifications with an average achievement score of 81.27. The final test table data (post test) of students can be seen in Figure 3.

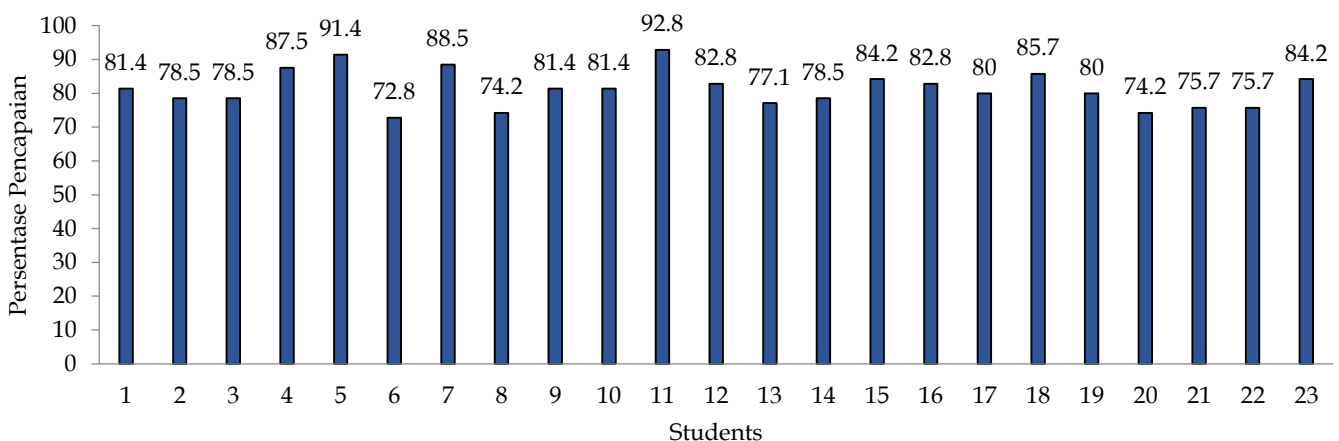


Figure 3. Final ability achievement scores

Based on Figure 3 above, it can be seen that the final ability of students is in the good classification with the highest student achievement score being 92.8 and the lowest being 72.8.

Improving Students' Cognitive Abilities During the Use of the TGT Type Cooperative Model with the N-Gain Test

The improvement of students' cognitive abilities is obtained from the initial test scores (pre-test) and final test (post-test) which are then used as data to calculate the N-Gain score. Learning carried out to determine the improvement of cognitive abilities using the TGT type cooperative learning model assisted by the quizizz application on the material of motion in objects can be seen in Appendix 14, while the qualifications for improving students' cognitive abilities can be seen in Table 6.

Table 6. Qualification of cognitive ability improvement scores

Achievement Score Interval	Frequency	Percentage (%)	Qualification
$g > 0.70$	19	82.6	Tall
$0.30 \leq g \leq 0.70$	4	17.4	Currently
$g < 0.30$	-	-	Low

(Source: Research Data, 2022)

Based on the data in Table 4.4 above, it can be seen that 19 (82.6%) students are in high qualifications and 4 (17.4%) are in medium qualifications. This shows that there is an increase in students' cognitive abilities in the material of object motion assisted by the quizizz application in learning. Individually, it can be seen in Figure 4.

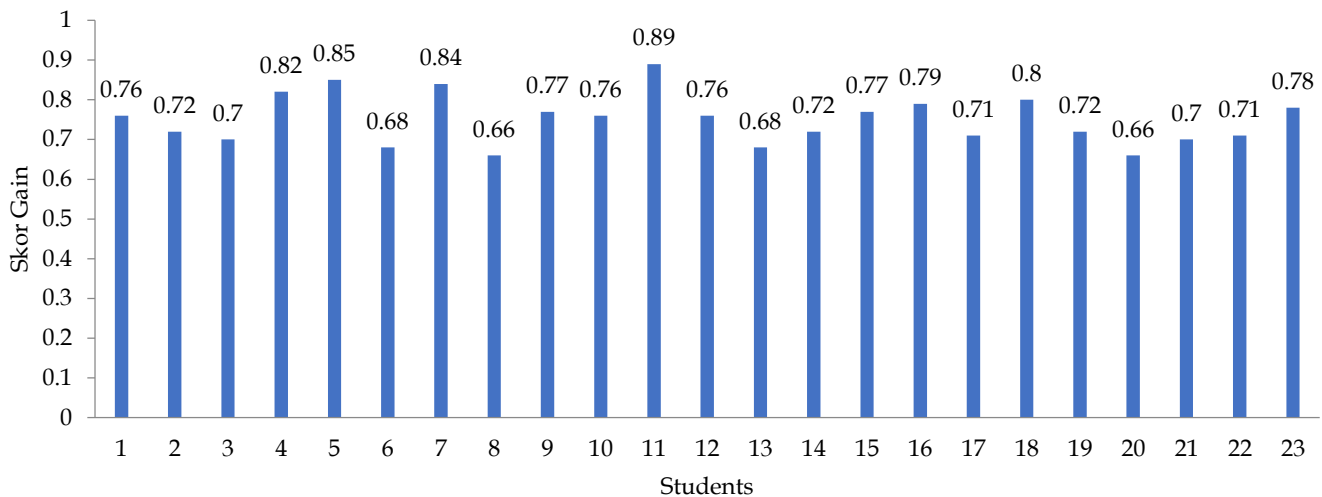


Figure 4. N-Gain Test

Based on Figure 4 above, it can be seen that there has been an increase in the cognitive abilities of students at a high qualification with the highest student achievement score being 0.89 and the lowest being 0.66. Based on the research results presented in Table 3 and Figure 1, it shows that the results of the initial test of students are in the qualification of failing because students have not understood the material listed in the initial test. Pre-Test is an assessment tool used to determine students' pre-existing knowledge. Usually, pre-tests are given before learning to determine the basis of knowledge, but here the test is used to test students before the topic material is discussed throughout the learning. Although counterintuitive, the pre-test includes material that students are not expected to know, but serves as a motivational tool and 'road map' for students, resulting in increased learning performance in the classroom.(Berry, 2008). In addition, the initial test is used with the aim of finding out the initial

understanding of students related to the material being taught and also to form student work groups with different levels of cognitive abilities, from high, medium, and low. Students' failure to complete the task can also be caused by students having a weak understanding of the concept, so that students do not have knowledge about the material.(Jamaludin & Batlolona, 2021). Some possible factors that influence low conceptual students are: First, teachers do not familiarize students with the physical phenomena around them, so that students experience a literacy crisis to trigger their critical thinking.(Longfield, 2009). Second, the limited knowledge of students from lower levels of education so that it does not become good knowledge when students are at higher levels of education. This triggers misconceptions and interferes with students in understanding new knowledge better.(Doctor & Mestre, 2014). Therefore, it is important for teachers to know students' misconceptions and make them an important

input in designing learning (Kaltakci-Gurel et al., 2017).

According to Jong et al., (2023) a learner has difficulty in understanding certain knowledge, this is because the new knowledge received has no relationship with previous knowledge, or perhaps prior knowledge before it was owned. This is illustrated by the results of the initial test of students, on average many students were unable to answer questions correctly, only questions that were considered easy were able to be answered correctly, and students answered incorrectly on questions that were considered difficult to work on. In addition, students got the lowest score of 73.6 at the first meeting of LKPD 1 with the material content of force and straight motion getting the highest score of 79.1. Students answered incorrectly on calculation questions such as numbers 4, 8 and 9. This is because students have not been able to distinguish speed and velocity well, because when the teacher explained the students did not pay attention to the teacher but talked to their friends.

The tournament using the quizizz application was conducted in 3 rounds with different questions for the three groups and started from the group with a high cognitive ability level. In the first session, all group members tried to get the best results. Where in this group there were students who had a maximum score of 100, and the others got an average score of 80 and 60, followed by the medium and low ability groups. In each session, 1 winner was found with a score highest. For the medium ability group, the highest score obtained is 80 and at the low level the highest score obtained is also 80. However, there are some students who still have low scores. This is because when in the tournament students are too hasty in answering questions, resulting in less than satisfactory results. In addition, there are also some students who have not read the questions properly but have answered, so they cannot change their answers anymore, because in the quizizz application the answers given can only be given once. There are also students who are able to complete the 5 questions given correctly.

In the assessment of learning outcomes, there were 9 students who were in sufficient qualifications, this was because in the teaching and learning activities the students did not pay attention to what the teacher said and played more with their friends during the learning process, but overall the students had knowledge and understanding of the material on motion in objects and were able to complete the given practice questions well. Based on the explanation above, it can be seen that the high cognitive ability of students regarding the material on motion in objects using the TGT type cooperative model assisted by the quizizz application has reached the minimum completeness criteria value of ≥ 70 . Therefore, the TGT type cooperative learning model assisted by the quizizz application has an impact on increasing students' cognitive abilities measured based

on the initial test score and final test score and calculated using the N-Gain formula. N-Gain is a comparison of the gain score obtained by students with the highest possible gain score obtained by students (Meltzer, 2002). The calculation of N-gain is obtained from the pretest and posttest scores of students and divided by the maximum score times one hundred. Increasing students' cognitive abilities, where the achievement scores obtained by students are very low, but after the learning process using the TGT type cooperative learning model assisted by the quizizz application, it can help students master the material and the values obtained have increased, namely 0.75 and are in high qualifications.

Conclusion

Based on the findings of the initial abilities of students before being taught using the TGT type cooperative learning model assisted by the quizizz application, it was proven to be in the failing qualification with an achievement score of 24.08. The cognitive abilities of students during the learning process assessed in the LKPD and tournaments obtained completeness from all groups who were in sufficient qualifications with an average value of 74.37. The average score of the final test achievement of students was 81.17 where 1 student was in a very good qualification, 10 students were in good qualifications and 12 other students were in sufficient qualifications. Meanwhile, the results of the analysis of the increase in students' cognitive abilities in the N-gain test obtained a value of >0.74 . These results were obtained because of the treatment given, with the TGT type cooperative learning model assisted by the quizizz application. Thus, 100% of students can be concluded that through the use of the TGT type cooperative learning model assisted by the quizizz application in physics learning, they have completed the material on motion in objects. Suggestions for further research are the use of the quizizz application with the TGT model in increasing creativity and innovation for inclusive students. This study still has limitations that only measure one aspect, namely cognitive abilities in grade 8 students.

Author Contributions

This manuscript was only written by the team (Sally E. Untajana, Ashari Bayu Dulhasyim, Vantri Pieter Kelelufna, Aprillia F. Telapary).

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Conflicts of Interest

The authors declare no conflict of interest.

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