The Effect of Using Solar System Scope Application on Participation of Students in the Solar System Sub-Matter of SMPN 24 Banjarmasin

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ABSTRACT

This study was conducted to examine the effect of using the Solar System Scope Application on students' learning participation in the Solar System sub-matter of class VII SMP Negeri 24 Banjarmasin. The research method used in this research is quasi experiment research with Non-Equivalent Control Group research design. The population in this study were all seventh grade students of SMP Negri 24 Banjarmasin, while the samples of this study were classes VIIG and VIIH which both amounted to 34 selected using purposive sampling technique by having certain reasons and categories. Data collection techniques used in this study were tests and observations. Hypothesis testing in this study using ANCOVA test, the results obtained a significance value of 0.020 <0.05 and tcount 5.707> ttabel 3.99 so that means H1 is accepted and H0 is rejected. The conclusion of this study is that the Solar System Scope application has an effect on students' learning participation. The magnitude of the influence of the research was carried out with the effect size test. The effect size test results were 0.418 with a medium category.

Keywords: Solar System Scope application, learning participation, solar system material, ANCOVA analysis.

INTRODUCTION

Education is a deliberate and planned effort to shape the environment and learning methods. In addition, education can also be explained as providing guidance to the responsibilities given by parents with the aim that children can grow into adults. In every educational process, there is an element of learning that shows that education has an important role in the learning process.

In the current 5.0 era learning process, the role of education still makes students a real but unreal object. Learners just sit and listen to the teacher explain the material and take notes during the learning process. Learners in schools sometimes use the concept of "5D", namely come, sit, listen, be quiet, and maybe snore (Dhaki, 2022).

The education process consists of three stages: input, process and output. Input includes the learning activities of students, process involves teaching and learning activities, while output is the result of the process. The purpose of implementing this educational process is to

produce a quality young generation that has high competitiveness in the post- Covid-19 pandemic era. The implementation of this educational process is expected to run systematically in schools, which are formal institutions capable of organizing teaching and learning activities. Students' learning participation is an important impact of education in Indonesia after the Covid-19 pandemic, which has the potential to cause a decrease in their learning outcomes.

Participation in learning can be defined as the involvement of learners mentally, emotionally and physically in achieving a goal with the responsibility involved. The role of learner participation has a key role in the dynamics of teaching and learning. The level of learner participation can have a significant effect on their learning outcomes. Teachers can give additional attention to learners who are less active in the learning process. Nowadays, a teacher is expected to have the ability to master a variety of innovative learning strategies.

In accordance with previous research conducted by Putri and Kelana (2022), it is argued that in the era of the revolution 4.0. Humans can use the functions of technology in their lives, especially in the context of education. Teachers have the potential to bring various innovations in the learning process by utilizing existing technology, so as to achieve learning objectives. The selection of appropriate learning strategies will create an interesting learning experience for students. Science learning at the junior high school level has various characteristics and challenges, so it needs to be considered carefully, precisely, and interestingly.

Monotonous science learning often makes students think that this subject is boring. One of the topics in junior high school science is the solar system, which should be taught with more interesting methods, such as direct observation rather than just through teacher lectures. This material is complex and requires in-depth understanding as it involves concepts, processes, symptoms and everyday events. Therefore, a learning design is needed that facilitates students' understanding of this solar system material. The use of platforms as learning media can increase learners' participation and make it easier for them to understand the material. Gadgets or electronic devices can be an effective tool because most learners are used to using them.

Research conducted by Sari in 2019 showed an increase in student participation in understanding solar system material through the use of the Solar System Scope application based on augmented reality. This application acts as a learning multimedia with images, data, and simulations, can be used both in the classroom and independently. Features such as solar

system, planet explore, star explore, night sky, near sky, and messier objects on the Solar System Scope application can display simulations of the motion and condition of celestial objects according to the time and location that can be set by the user. The ease of operation of this application is expected to overcome the obstacles previously described.

The use of solar system, planet explore, and star explore features is the focal point of the solar system sub-matter. Researchers want to prove from the written problem if student participation can be increased with different science learning. Especially in the solar system sub-matter. The solar system sub-matter will be carried out with learning using the Solar System Scope Application. Researchers want to conduct research with the title "THE EFFECT OF USING THE SOLAR SYSTEM SCOPE APPLICATION ON STUDENT PARTICIPATION ON THE SUB-MATTERY OF THE SOLAR SYSTEM CLASS VII SMPN 24 BANJARMASIN".

Based on this title, the problem formulation used in this study is "Is there an effect of using the Solar System Scope application on students' learning participation in the solar system sub-matter of class VII SMPN 24 Banjarmasin?". Based on the formulation of the problem, the purpose of this study is to determine whether there is an effect of using the Solar System Scope application on the learning participation of students in the solar system sub-matter of class VII SMPN 24 Banjarmasin.

THEORETICAL BASIS

Solar System Scope Application

The Solar System Scope app, which is one of the tools supporting solar system learning, offers an interactive experience for users. The app provides a variety of features that are easy to use in various places, accessible for free via mobile phone or computer. By providing a realistic simulation of the solar system and other celestial objects, Solar System Scope becomes a planetarium application that allows observers to see the solar system directly and engage in concept exploration, as mentioned by Aridya & Shofiyah (2023).

Quoted from INOVE's official source in 2017, Solar System Scope is an interactive astronomy app developed by the Beyer brothers in Germany in 2010. The app offers an augmented reality experience that allows users to visually explore a model of the solar system (planetarium) with realism. In addition, the app provides information about celestial bodies

outside the solar system, such as stars and constellations, which can be accessed for free or with paid options via mobile devices and computers.

Figure 1. Solar System Scope app logo

The features provide support to users to identify the image structure of celestial bodies, set the rotation of planets directly, understand the rotation of planets, explore objects other than planets, and provide detailed information about each object in the solar system. This facilitates a deeper understanding of the solar system.

Figure 1. Solar System Scope application features

According to Sari et al. in 2019 the main features available in the Solar System Scope application include.

1. Solar System

The Solar System feature serves as the main menu in the app, allowing users to explore the solar system through a sky map or simulation. The map displays various celestial objects

such as planets, stars, comets, asteroids, and constellations, according to the position of the sky at a time and location that can be manually set in the app.

Users can adjust the display of objects on the screen according to their preferences through the settings. If the user wants to see planets and stars without their orbits, it can be customized in the settings. This solar system model also functions as a planetary motion simulation, allowing realistic observation of the rotation and revolution of celestial objects, according to the preset date, time, and speed.

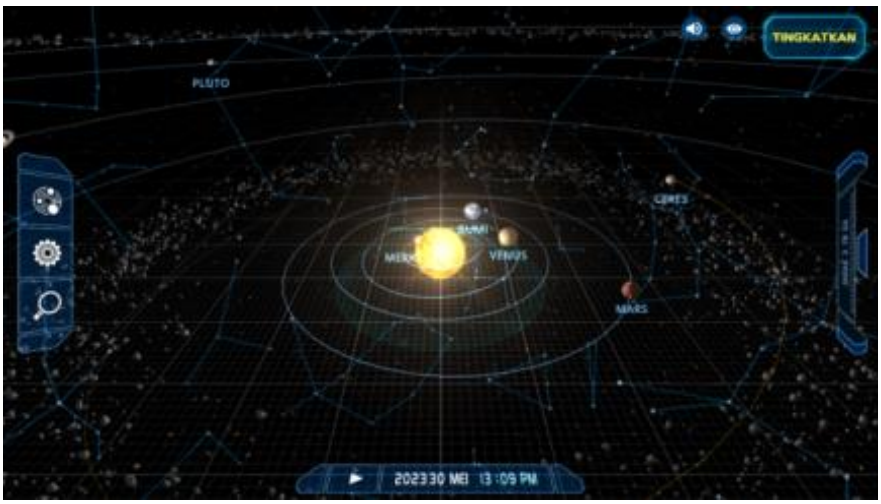

Figure 2. Solar system feature

2. Planet Explore

The second feature is Planet Explore, where users can access various information about the eight planets in the solar system and their satellites, as well as four dwarf planets. When users select a planet or celestial object to explore, they can choose between Planet System/Orbit, Encyclopedia, and Structure.

In the Planet System/Orbit option, the app displays a sky map-like view, focusing on the object and orbit associated with the user's selection. The Encyclopedia menu presents mathematical data such as the mass, diameter, period, and temperature of the observed celestial object, as well as the distinctive characteristics, discovery history, and latest news of the planet.

Of the celestial object. Meanwhile, the Structure menu provides information about the structure or layers and composition of the observed celestial object in 3D.

Figure 3. Planet explore feature

3. Night Sky

The Solar System Scope application uses AR (Augmented Reality) which utilizes GPS (Global Position System) technology. So in this Night Sky feature, users can see the actual position of a celestial body.

Figure 4. Night sky feature

4. Near Star

The last feature is Near Star, which allows users to observe stars that are close to the solar system. In addition, users can view the star's position directly and search for other star positions using the Search feature.

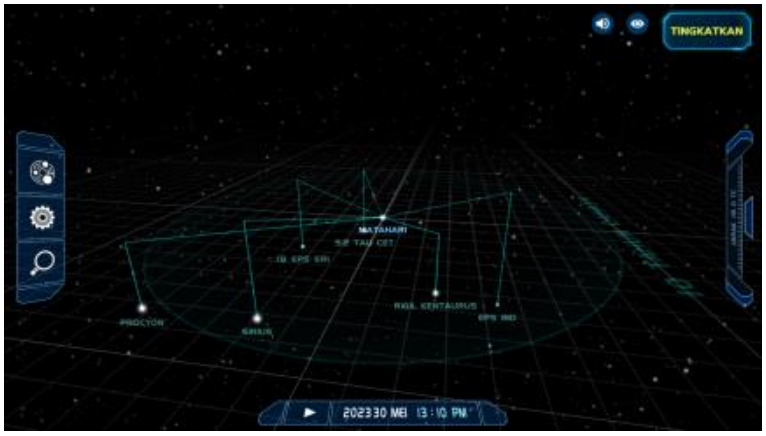

Figure 5. Near star feature

GPS Based Tracking is an advantage of Solar System Scope. This application provides augmented reality technology to the user. Augmented reality is a renewable technology that allows virtual objects to be connected to one of the specified target points while images of the real environment are captured by the camera, and the final sahil is interpreted through the program (Kye & Kim, 2008). The existence of Augmented Reality (AR) has become a crucial element in the development of technology, with all applications having a common goal, namely to facilitate human tasks, including in the field of astronomy (Parno & Agustinus, 2023).

Learning Participation

Learning is a deliberate and structured effort made by educators to guide students in the process of learning activities. In the context of learning, educational interaction between educators and learners is crucial to achieve certain goals. The active involvement of students in learning activities is an important element, and the success of learning is greatly influenced by the participation that exists between teachers and students (Budiani, 2020).

The importance of learner involvement and participation in the teaching and learning process confirms that two-way interaction between teachers and learners must be realized. This concept has theoretical support in self-determination theory, as proposed by Ryan & Deci (2017). In addition, learner participation is identified as a factor that influences school climate and academic achievement, as described by Thapa et al. (2013).

Participation, in this context, refers to real involvement in an activity. It can be interpreted as a process in which a group of people, as members, discover and apply ideas (Mulyasa, 2003). Furthermore, participation is understood as the mental and emotional involvement of

individuals in a group context, encouraging them to develop their thoughts and feelings in order to achieve a common goal with responsibility for the achievement (Suryobroto, 2002).

Learning is a complex process, not just remembering information, but also involves changes in behavior. It involves learner actions and behaviors that are complex in nature. The learning process occurs when learners gain knowledge from the surrounding environment, which can involve various elements such as natural conditions, objects, animals, plants, humans, or other things as a source of learning (Dimyati & Mudjiono, 2006). According to Slameto (2003:58), learning is a person's effort to achieve new behavioral changes as a whole, the result of personal experience in interaction with the environment.

Learning participation, on the other hand, refers to learners' involvement in learning endeavors to achieve specific goals. Learners need to be responsible for the success of achieving learning goals, because their participation is needed in setting learning goals and activities (JJ & Moedjiono, 2006, p. 56). Hasibuan, Harmain, R (2021:35-42) also agrees that learner participation involves physical and psychological involvement in the learning process, with the aim of achieving satisfactory learning outcomes.

Learner participation is the key focus in the learning process, helping to develop the potential and aspects of learner development towards the optimal direction. Without the active participation and involvement of learners, the learning process cannot run well. Every student is naturally active in learning; the difference lies in the extent of the child's activity level. The level of children's activity can be divided into low, medium and high.

Sudjana, Nana (2002: 21) and Yamin, Martinis (2007: 84) said that students who actively participate can be seen, namely by:

1. Learners participate in determining the learning objectives of learning activities.
2. Focus on affective aspects in the learning process.
3. Learners are actively involved in learning activities, especially through interactions between fellow learners.
4. The class functions as a cohesive learning group.
5. Give learners the freedom to l e a r n , with opportunities to act and make important decisions in learning.
6. Allow time for learners to deal with personal issues, both related and unrelated to learning.

Solar System Sub-matter

Science has a theoretical nature that cannot be observed directly, so it requires special tools to communicate it. The success of an education is judged by the achievement of learning objectives, where the core of these objectives is concept mastery. Concept mastery cannot be achieved only through teacher interpretation using conventional methods (Rahmah et al., 2017).

The importance of the learning experience gained by students on their learning outcomes emphasizes the need for appropriate methods and strategies to achieve learning objectives. Factors, including learning media, influence the achievement of learning objectives (Rozie, 2018).

Solar system material, which includes natural phenomena in space including the earth, is difficult to observe directly or is abstract. Therefore, visualization or animation is needed to understand it (Nurhamidah et al., 2021). This material requires students to be able to describe the celestial bodies in the solar system and is theoretical, in line with the research findings of Ifani et al., 2021 which state that this material is abstract because it cannot be observed directly.

The 2013 junior high school science book contains the Solar System chapter in semester 2, consisting of four sub-chapters, including the Solar System, Earth Conditions, Moon Conditions, and Eclipses. This research focuses on the Solar System sub-chapter, which includes the components of the solar system.

The characteristics of solar system material involve factual and conceptual knowledge. Factual knowledge is related to activities or statements that match the situation, while conceptual knowledge involves the ability to categorize and classify data, point out advantages or disadvantages, and understand principles and theories. Therefore, learning solar system material, with factual and conceptual characteristics, becomes learning structured with concept understanding.

The solar system is an arrangement of celestial bodies consisting of the sun as its center, planets, comets, meteoroids, and asteroids that surround the sun. The solar system also orbits the sun, where the Sun's gravity affects the movement of objects in this system, just as the Earth's gravity affects the movement of the Moon orbiting it (Widodo et al., 2017: 150-151). Although the solar system exists in universes and galaxies, this Grade VII solar system sub-material focuses on the components of the solar system and their characteristics.

METHODOLOGY

This research uses a quasi-experimental method with one class as an experiment and one class as a control. The purpose of this study was to assess the impact of using the Solar System Scope application on the level of student learning participation.

The research design applied was nonequivalent control group by giving pre-test and post-test to both classes. At the beginning of learning, students in the experimental class took a pre-test. After that, the experimental class received a certain treatment, and the learning session ended with a post-test. Through this design, the effect of using the Solar System Scope application on students' learning participation in the solar system sub-matter can be analyzed from the pre-test and post-test results.

Table 1. Research design

Class	***Pre-test***	**Treatment**	***Post-test***
Experiment	O_1	X_a	O_2
Control	O_3	X_b	O_4

Description:

O_1, O_3 : *Pre-test*

X_a : Treatment with Solar System Scope application

X_b : Treatment withOUT Solar System Scope application

O_2, O_4 : P*ost-test*

The population involved in this study involved all seventh grade students in one of the public junior high schools in Banjarmasin City. The research sample consisted of 68 seventh grade students who were evenly distributed, 34 students in the control class and 34 students in the experimental class. The sample selection was carried out using convenience sampling technique because the distribution of students in each class was not in order based on grades, and there were no superior classes. In addition, some of the researchers' reasons included the selection of schedules that did not coincide in both classes and the implementation of learning materials that had not been taught.

Data collection was carried out through giving test instruments in the form of multiple choice questions and observation sheets. The test consisted of 20 multiple choice questions given before and after learning. Meanwhile, the observation sheet includes 10 indicators of learning participation divided into three sub-aspects, as listed in table 2 below.

Table 2. lattice of student learning participation observation sheet

Aspects	**Sub-aspects**	**Indicators**	
Learning participation	Students are manged in learning	1.	Pay attention to the teacher who is explaining the lesson material
		2.	Work hard in answering questions asked by the teacher
		3.	Ask questions if something is not clear
		4.	Express opinions in class with confidence
	Establish reciprocal relationships	5.	Pay attention to other groups when giving an opinion/presentation
		6.	Participate in discussions and be able to collaborate
		7.	Conclude lesson material with confidence
	Comply with learning rules	8.	Come to class on time with a high sense of discipline
		9.	Responsible for carrying out specified support requirements
		10.	Does not interfere with learning (be orderly in class)

In this study, the hypotheses made by researchers are the null hypothesis (H0) and the working hypothesis (Ha) as follows.

H_0 : The use of learning media Solar System Scope application has no influence on the participation of students in the solar system sub-matter.

H_a : The use of learning media Solar System Scope application has an influence on the participation of students in the solar system sub-matter.

This hypothesis was tested through ANCOVA analysis, with the pre-test score as the covariate variable for both classes. The data processing in this study consisted of several stages, including observation data analysis, test prerequisites (such as residual normality test,

homogeneity of variance test, and linear regression coefficient homogeneity test), and hypothesis testing.

The non-test instrument used is the learner participation observation sheet, which includes 10 indicators. The purpose of this observation sheet is to evaluate the impact of using the Solar System Scope application on students' learning participation in each indicator. The observation sheet is organized on a Likert scale with four answer options, namely very good, good, sufficient, and less.

RESULT AND DISCUSSION

In this study, researchers aimed to evaluate the impact of using the Solar System Scope app on the level of engagement in learning the solar system sub-matter among students. Two groups were compared: one group that was taught with the Solar System Scope app and another group that did not use the app. Before and after the learning session, both groups answered 20 multiple choice questions. The results of the tests conducted on the experimental and control groups can be found in Table 3.

Table 3. Recapitulation of scores for both classes

No.	Data Descriptive	Pretest		Posttest	
		Class Eksperiment	Class Control	Class Eksperiment	Class Control
1	Minimum	10	10	45	25
2	Maximum	85	70	90	80
3	Mean	51	45	70	62

Based on table 3 above, it can be seen that the average value (mean) of the experimental class in the pre-test was 50.6, while the control class reached 45.4. In the post-test, the mean value of the experimental class increased to 69.9, while the control class reached 62.1. This post-test data indicates that the last meeting in the experimental class, which used the Solar System Scope application, achieved higher scores than the control class. This difference can be seen from the mean, minimum, and maximum data, which shows that the experimental class is superior to the control class. Although both experienced a significant increase from the pre-test score.

However, further statistical tests are needed to validate the data obtained. The first test was the residual normality test, in which the post-test scores of the experimental and control classes were rescaled to ensure normal distribution. The results showed that both data were normally distributed. After that, a variance homogeneity test was conducted, which showed that both classes had a homogeneous variance distribution, as seen in the Levene's Test of Equality of Error Variances table.

The last prerequisite step is the linear regression coefficient homogeneity test, which aims to evaluate the relationship between the use of Solar System Scope application, the pre-test scores of both classes, and students' learning participation. As a result, information was obtained that the data was homogeneously distributed, as seen in the Parameter Estimates table analyzed using SBM SPSS Statistic 22 software.

By ensuring that the data were normally distributed and homogeneous, the researcher continued with the ANCOVA analysis hypothesis test. The statistical test results of the research data can be found in table 4.

Tabel 4. ANCOVA test results

Tests of Between-Subjects Effects

Dependent Variable: Posttest

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	\5174.541[a]	2	2587.270	23.300	.000	.418
Intercept	12176.853	1	12176.853	109.660	.000	.628
Pretest	3894.761	1	3894.761	35.075	.000	.350
Group	**633.729**	**1**	**633.729**	**5.707**	**.020**	**.081**
Error	7217.739	65	111.042			
Total	312175.000	68				
Corrected Total	12392.279	67				

a. R Squared = .418 (Adjusted R Squared = .400)

Based on the results of the ANCOVA test analysis in table 4 that the pre-test as a covariate means that to determine the effect of using the Solar System Scope application on student learning participation can be seen in the group section line to eliminate. Significantly

the Solar System Scope application makes changes in learning participation as much as 0.020 <0.05 and by proving the tcount> ttable which is 5.707> 3.99 which means Ha is accepted that there is an effect of using the Solar System Scope application on student learning participation in the solar system sub-matter.

The Solar System Scope application on students' learning participation can be seen through the results of the effect size test by paying attention to table 4 in the Corrected Model row in the Partial Eta Squared column. The effect size test is interpreted in table 5 below.

Tabel 5. Interpretation of effect size

Effect Size	**Interpretation**
$0 < d < 0,2$	Small
$0,2 < d \leq 0,5$	Medium
$0,5 < d \leq 0,8$	Large
$d > 0,8$	Very large

Based on the Corrected Model row, Partial Eta Squared column, the influence of using the solar system scope application is 0.418 with a significance value of 0.000. This shows that the influence of using the solar system scope application on students' learning participation is classified as moderate, the value of 0.418 is in the interpretation of $0.2 < x < 0.05$. Apart from that, to find out the relationship between the use of the solar system scope application, it can be seen in table 4. The R Suared section is 0.418, which means that the use of the solar system scope application has an influence on learning participation by 41.8%, the rest is controlled by other factors.

The effectiveness of the solar system scope application was described by (Khatimah, Fatkhomi, Atika, & Taowatto, 2023) who stated that students will easily understand learning about the solar system material because using this application there are various features that support learning in it. In line with the research that has been carried out, learning that is only carried out in control or conventional classes cannot have a very high influence on students' learning participation in learning using the solar system scope application. Therefore, it can be seen that students who learn using the solar system scope application will influence students' learning participation. The advantage of the solar system scope application is the main advantage as an interactive, effective and optimal medium in increasing student learning participation.

Sari et al in 2019 also expressed the opinion that the use of the solar system scope application was also supported by students' statements regarding their interest in this application. Students stated that they were more interested in learning solar system sub-materials after implementing learning in using the solar system scope application. This statement is also supported by the large number of students who are able to use devices well. The solar system scope application is an interactive learning application based on augmented reality that allows users to explore the solar system model (planetarium) in a realistic visual manner. According to (Uygur, Yelken, & Akay, 2018) augmented reality is a new generation technology in the form of 2D, 3D images, audio files and videos that are read.

The solar system sub-material is contained in CHAPTER Solar System class VII Semester 2 at SMP/MTs. This material is one of the most difficult materials to observe directly or is abstract, so that learning requires visualization to learn it. In line with research (Ifani, Munzil, & Setiawan, 2021) which states that the solar system material is abstract and therefore requires applications or learning media that can observe the phenomena of celestial bodies.

Ten participation indicators divided into three sub-aspects. The first aspect is that students are managed in learning, the second aspect is that students establish reciprocal relationships, and the last aspect is that students comply with learning rules.

Table 6. Recapitulation of managed aspects of student learning

No.	**Sub-aspect**	**Persentase (%) Class Eksperiment**	**Category**	**Persentase (%) Class Control**	**Category**
1	Pay attention to the teacher who is explaining the lesson material	96,3%	Very high	80%	High
2	Work hard in answering questions asked by the teacher	86,8%	Very high	76.3%	High
3	Ask questions if something is not clear	83,1%	High	75.7%	Moderate

4	Express opinions in class with confidence	86%	Very high	83.8%	High
	Results	352,2		315,8	
	Mean	88%		79%	

The results of the observation sheet analysis of the aspect of students establishing reciprocal relationships are listed in table 7 below. The results show that the experimental class percentage is even greater than the control class. The average of the experimental class is 95%, while the average of the control class is 81%.

Table 7. Recapitulation of aspects of students establishing reciprocal relationships

No.	**Sub-aspect**	**Percentage (%) Experiment class**	**Category**	**Percentage (%) Control class**	**Category**
5	Pay attention to other groups when giving an opinion/presentation	98,5%	Very high	89.7%	Very high
6	Participate in discussions and be able to collaborate	99,2%	Very high	78.7%	Tinggi
7	Conclude lesson material with confidence	87,5%	Very high	75.7%	Cukup
	Results	285,2		244,1	
	Mean	95%		81%	

The aspect of learners obeying the order of learning is the last aspect observed, the average control class in this aspect is 93% and the experimental class is 99%. The results of the recapitulation of this aspect can be seen in table 8 below.

Table 8. Recapitulation of Students Obeying the Learning Rules

No.	Sub-aspect	Percentage (%) Experiment class	Category	Percentage (%) Control class	Category
8	Come to class on time with a high sense of discipline	100%	Very high	100%	Very high
9	Responsible for carrying out specified support requirements	99,3%	Very high	94.1%	Very high
10	Does not interfere with learning (be orderly in class)	97%	Very high	83.8%	High
	Results	296,3		277,9	
	Mean	99%		93%	

Based on the results of the analysis of the three tables of the sub-aspects of students' learning participation, it can be concluded that the aspect of mutual relations between students in the experimental class has a very high average category, while the control class has a high category. In particular, indicator number 8, namely entering class on time with the highest level of discipline, reached a percentage of 100% in both classes.

In recapitulating the sub-aspects of learner participation in one of the public junior high schools in Banjarmasin City, it can be revealed that the highest indicator is the 8th indicator, namely entering class on time with high discipline, reaching 100% in both classes. Furthermore, the second highest indicator is the 6th indicator, which is the participation of students in discussions and the ability to cooperate, reaching 99.2% in the experimental class and 94.1% in the control class in the 9th indicator, which is the responsibility of carrying the specified equipment (package books, student worksheets, and stationery).

Meanwhile, the lowest indicator in the experimental class was indicator number 3 with a percentage of 83.1%, which observed students asking questions if something was unclear. Some factors that can explain this low percentage include learner answers that have been fulfilled in the Solar System Scope application, showing weaknesses in the preparation of the learner worksheet. In the control class, indicator number 3 and number 7 were the lowest

indicators with a percentage of 75.7% each. Indicator number 7 assessed learners' ability to summarize the lesson material confidently.

Indicator number 4, students express opinions in front of the class with confidence is the lowest indicator in the experimental class with a percentage of 86%. They are active in discussions seen in the indicator of p a r t i c i p a t i n g i n discussions and being able to work together on indicator number with a percentage of 99.2%. However, when expressing their opinions they pointed at each other between friends, there were also students who only gave answers but not the students who threw them.

Working hard in answering questions posed by the teacher in indicator 2 became the second lowest indicator in the control class. This indicator amounted to 76.3% in the sufficient category. In the control class they were still reluctant to answer the questions asked. So that their participation is still considered lacking.

It can be concluded that the comparison of students' learning participation in the experimental class is higher than the participation of the control class which conducts conventional learning. And the use of the Solar System Scope application can be an alternative interactive learning media that can be accepted by students.

CONCLUSION AND RECOMMENDATION

Conclusion

Based on the research results and discussion, it can be concluded that the utilization of Solar System Scope application has a significant impact on students' learning engagement. This can be seen in the results of the ANCOVA hypothesis test analysis, which shows a considerable impact.

In addition, Indicator number 8 reached the highest category with data achievement reaching 100%. The success of students attending on time became Indicator number 8, as both experimental and control classes showed a high level of self-awareness. On the other hand, Indicator number 3, which relates to asking questions if there is confusion, is the indicator with the lowest participation rate, reaching 83.1% for the experimental class and 75.7% for the control class. Furthermore, Indicator number 4 also ranked second lowest in the control class, with 75.7% learner participation, similar to Indicator number 3.

Recommendation

In the conclusion that has been explained, some suggestions can be made as follows.

1. Learners are expected to use technology wisely to integrate the Solar System Scope application in learning Earth and Solar System material.
2. Teachers are expected to utilize technology as a learning tool in the independent curriculum, with the aim of adding variety in teaching methods to overcome boredom and increase learner participation, thus achieving optimal learning outcomes.
3. Schools should consider using the Solar System Scope app to improve the quality of teaching, keep up with technological advances in education, and consider learning strategies to increase learners' participation in the context of global development and increase their resilience in facing various challenges.

Overcoming the limitations of this study, it is recommended that further research be carried out related to the use of the Solar System Scope application. Other researchers are expected to develop more comprehensive research, involving wider research variables, more in-depth learning curriculum, and new elements that can support research, so that it can be applied better.

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