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Improving Learning Motivation of Natural-Social Science Learning Through Game-Based Learning Utilising Quartet Cards

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Abstract: Objective: This research aims to determine the effect of using the game-based learning (GBL) model on fostering learning motivation in natural-social sciences (IPAS) learning. The use of the game-based learning model can serve as an alternative in innovative learning activities. **Method:** The method used in this research is a quasi-experimental method with a quantitative approach. This research uses a one-group pre-test and post-test design. The subjects in this study are 24 third-grade students at SD Negeri 2 Danguran. The data analysis technique used is the "t" test processed using the SPSS 29 application. In the implementation of the research, natural-social science learning used the GBL model with learning media, IPAS quartet cards. Data collection was conducted through the completion of questionnaires that had been tested for validity and reliability. **Findings:** The significant learning motivation scores of students can be interpreted as the null hypothesis, which states that there is a difference after and before the implementation of the game-based learning is received. The average score of students' responses after the treatment is better than the average score of students' responses before the treatment. **Conclusion:** Implementing an innovative and interactive learning model for students, specifically through a game-based learning model utilizing IPAS quartet cards, led to this increase.

Keywords: game-based learning, quartet cards, learning motivation, natural-social science.

▪ INTRODUCTION

Learning in the Indonesian Educational Curriculum expects teachers and students to engage in teaching and learning activities freely while still considering the meaningfulness and usefulness of the learning for the students, which can be interpreted as student-centered learning. Although teachers and students are given freedom in teaching and learning activities, these activities may deviate from the national education goals. However, in practice, teachers are only focused on delivering the learning material. Until now, there are still many teachers who apply conventional teaching methods in schools, such as in IPAS learning (Adinata et al., 2020). The conventional learning method positions the teacher as the source of knowledge. Meanwhile, students become passive, merely receiving knowledge, which leads to less participation in the learning process. Teachers more often use conventional teaching methods such as lectures, where the teacher communicates verbally with students in a one-way manner (Adilah, 2017; Yuwanita et al., 2020). The recommended lecture method is one that includes several variations, meaning it is delivered while simultaneously utilizing media, tools, and learning resources, and includes interactive dialogue or discussion. Additionally, teachers also use the discussion method, which is a learning method that presents material through a problem or question that will later be solved through group activities. However, in reality, most teachers currently use the lecture method without utilizing tools or media. Thus, IPAS learning is considered by students as a boring and tedious subject, especially for memorization-based material.

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Innovative learning is currently being actively promoted by the government. Innovative learning can engage students in learning activities, thereby fostering their motivation to learn. After students are motivated and actively participate in learning, their academic performance will also improve. The game-based learning model is one of the cutting-edge IPAS learning strategies used in elementary schools (Winatha & Setiawan, 2020). With the game-based learning model, students participate in educational activities via a game (Nugraheni, 2022; Wang & Zheng, 2021). In the implementation of GBL learning, teachers can be assisted by using learning media. One of them is the quartet card media.

Quartet cards can be used as a learning medium. This is based on the fact that card games are currently popular among students. Usually, they play cards during recess. In addition, the materials and production of quartet cards are very affordable. The cards can also be played anywhere because they are easy to carry. Based on these factors, quartet cards are very effective as a learning medium. This statement is supported by research from Sendi Fauzi Giwangsa, where quartet cards are deemed very suitable as one of the alternative learning media (Giwangsa, 2021). The researcher's concept to package IPAS learning utilizing the game-based learning (GBL) model with the IPAS quartet cards media is based on observations and pertinent research. The learning is expected to be enjoyable, engaging, and meaningful, and to attract their participation so that students can easily grasp the information or knowledge being taught. In addition, it can increase students' motivation to learn.

The Indonesian Educational Curriculum is a curriculum that is currently implemented in all educational units in Indonesia. The Indonesian Educational Curriculum is implemented nationally, where all levels of education use this curriculum, including the Elementary School level. The Indonesian Educational Curriculum itself aims to develop students' competencies as lifelong learners that reflect the Pancasila Student Profile through flexible learning and a focus on basic or essential materials (Kemendikbud, 2024). In addition, the purpose of the Indonesian Educational Curriculum is to foster the creativity, emotions, physical well-being, and aspirations of students through meaningful and effective learning experiences (Wahyudin et al., 2024). The principles of developing the Indonesian Educational Curriculum in educational units are to develop students' competencies, nurture students' character, be flexible, and focus on essential materials.

Ministry of education firmly believes that the Indonesian Educational Curriculum was created as a curriculum centered on fundamental materials and tailored to the abilities of students, with schools given the freedom to implement it (Kumalasari, 2024). The Indonesian Educational Curriculum liberates educational units in organizing learning at their respective schools. The curriculum is tailored to the conditions of each school. In addition, teachers are given the freedom to design more engaging lessons by considering the characteristics of the material and the students. The Indonesian Educational Curriculum provides students with the freedom to process information and knowledge in their own ways.

At the primary school level, the Indonesian Educational Curriculum is organized into three phases by the Ministry of Education, Culture, Research, and Technology: Phase A is for the 1st and 2nd grades, Phase B is for the 3rd and 4th grades, and Phase C is for 5th and 6th grades (Menteri Pendidikan Kebudayaan Riset dan Teknologi Republik

Indonesia, 2022). The main activities in the Indonesian Educational Curriculum consist of intramural, co-curricular, and extracurricular activities. Schools are given full responsibility for the implementation of learning activities and the Pancasila Student Profile Strengthening Projects, adjusted to local wisdom, utilizing the facilities owned by the school, and the background of the students. Learning activities or extracurricular activities must be based on the learning outcomes of a particular subject. Meanwhile, the strengthening project Profil Pelajar Pancasila (P5) aims to strengthen the character outlined in the Profil Pejalar Pancasila based on the Graduate Competency Standards. (GCS). Schools can add local content subjects that align with the characteristics of the region and are based on the regulations set by the respective local governments.

The Indonesian Educational Curriculum is implemented by modifying several parts or elements of the 2013 curriculum, the addition of Natural-Social Sciences (IPAS), a blend of the social and natural sciences, English as an elective, and the arts as a skill subject are among the modifications made at the elementary school level (Wijayanti, 2023). The reason for studying the IPAS subject at the basic education level is as follows: (1) students at the elementary education level usually see an object or event as a whole, (2) students at the cognitive stage think concretely, comprehensively, and broadly but less in detail, and (3) this integration expects students to be able to maintain the natural and social environment sustainably (Kemendikbudristek, 2022).

The subject of IPAS at the elementary education level begins to be studied in Phase B, specifically in the third grade. This aims to enhance students' environmental awareness regarding the conditions of their surroundings, both natural and social aspects. The IPAS learning at the elementary education level focuses on basic literacy skills and the ability to understand integrated concepts while studying the surrounding environment. Thus, in the learning process, an inquiry process will emerge by investigating and discovering the connections between natural phenomena and social phenomena occurring in the surrounding environment (Wijayanti, 2023). Science refers to the collection of knowledge that is then systematically organized based on cause-and-effect relationships.

The subject of IPAS can be defined as a science that studies the reciprocal relationship between living beings and inanimate objects in this world. This subject also studies humans as individual beings as well as humans as a society that interacts with the environment. The role of the IPAS subject in realizing students who have the Pancasila student profile as the ideal character of Indonesian student profiles. The IPAS subject can develop students' curiosity about events happening around them. Through IPAS learning, students are able to understand the interaction between the natural environment and human life on Earth. With a good understanding of how to identify problems and find solutions, students are expected to have an awareness of the importance of collaboration in maintaining social harmony and being responsible for taking care of the Earth. One example related to climate change starts from identifying its causes and impacts to efforts to prevent it.

Motivation is the ability possessed by someone that comes from within oneself or from external sources, which can drive a person to perform tasks (Uno, 2016). With motivation, a person will be more enthusiastic about achieving a specific goal. The same goes for learning motivation. Learning motivation is the motivation someone has to acquire information or knowledge in various ways. Motivation can be in the form of internal drives and external drives. Internal motivation is the drive that comes from within

the individual, emerging in their conscience to seek information or knowledge on their own.

The Game Based Learning (GBL) model can be defined as cooperative learning that presents educational material through a game activity so that students can collaborate to complete the game (Imtiyaaz, 2023). This GBL learning has characteristics such as the results obtained by students through games, the presence of game rules, feedback in the form of student cooperation, and active participation in the game. The benefits of using GBL learning are to increase student motivation and activity, enhance cooperation, improve students' problem-solving skills, boost students' creativity, and train students' courage.

Learning media is a tool used by teachers to convey material to students during the learning process (Imtiyaaz, 2023). By using learning media, it can reduce the boredom of students during the teaching and learning activities. The teacher's skills in using learning media can influence the students' activity and motivation. The more creative the teacher is, the more interested the students will be in participating in the learning process.

Quartet cards are a game that is very familiar to students. Cards that contain images and descriptions with four in each category. Quartet cards are usually played in groups. In the hands of a creative teacher, quartet cards can be transformed into an engaging learning medium. In this study, the researcher utilized quartet cards as a learning media for IPAS. By using this media, it is hoped that students can understand and remember the learning material well and increase their motivation. Quartet cards were selected as the media because of their visually appealing, easily comprehensible, and easily usable.

▪ METHOD

Participants

This research was conducted at SD Negeri 2 Danguran Klaten, using a sample from the 3rd grade with a total of 24 students as research subjects. The sampling technique in this study uses purposive sampling. Purposive sampling is determining the sample based on a specific purpose or selecting those who are closest and most knowledgeable about the information or issues being researched. Purposive sampling also selects respondents most likely to provide relevant results and useful information (Campbell et al., 2020). This sample technique addresses specific concerns, such as establishing criteria for students who have low motivation to learn.

Research Design and Procedures

This research uses a quantitative methodology. Research that gathers numerical data and analyzes it using statistical or mathematical techniques is known as quantitative research (Pratiwi & Wuryandani, 2020). This research was conducted using a quasi-experimental method. The quasi-experimental method or pseudo-experiment is a type of experimental method that uses the entire intact subjects to be treated. The design used is a one group pretest-posttest where the group is studied before and after being given the treatment. Students' motivation to learn can be assessed using this technique. Before implementing the game-based learning model using IPAS quartet cards, a questionnaire about students' learning motivation was administered to determine their learning motivation profile. The game-based learning model then guided the learning process over four sessions. The topic studied was about the diversity of animals around us along with their characteristics and life cycles. After completing the series of lessons using the game-

based learning model and the IPAS quartet card media, the researcher asked the students to complete the learning motivation questionnaire.

Instruments

This research's data collection method is a non-test method. A questionnaire was employed by the researcher. Based on previous research, the indicators of learning motivation include: (1) students' attention, (2) students' active participation in learning, (3) enthusiasm for completing tasks, (4) the presence of encouragement and learning needs, (5) self-confidence, and (6) enjoyment in problem-solving (Simaremare et al., 2021). Indicators of learning motivation include: (1) students who actively complete their assignments, (2) students who solve problems while learning, and (3) students who are not afraid to ask teachers and peers questions, and (4) students actively seeking information on their own (Arifin & Abduh, 2021). Referring to the research, the indicators of learning motivation in this study consist of 4 indicators presented in 20 statements. Table 1 displays these indicators.

Table 1. Indicators for measuring learning motivation

Indicator	Statement Items
Interest in learning	
Measuring students' interest in participating in learning.	1. 14. 18
Task and goal-oriented	
Measuring students' efforts in fulfilling learning tasks, understanding learning materials, having learning goals, and making efforts to achieve learning goals.	6. 7. 8. 9. 15. 19
Engagement in learning	
Measuring the level of student activity in classroom learning activities.	2. 5. 10. 16. 20
Extrinsic Motivation	
Measuring the extent to which students' motivation is influenced by external factors such as rewards, praise, punishment, learning environment, and the mood of the students.	3. 4. 11. 12. 13. 17

Before the research instrument in the form of this questionnaire is used in data collection, this instrument has been validated with content validation by experts. The experts stated that the statements used in the questionnaire are in accordance with the indicators used to determine the learning motivation of students in this research. The questionnaire approach used in the research is the Likert scale. This scale has different scores according to the categories of the statements. In filling out this questionnaire, students can express their attitudes in five categories: always, often, sometimes, rarely, and never. Categorizing the motivation indicators with the interval used is the students' learning motivation data, which consists of 20 statements with scores ranging from 1 to 5. The maximum score (20x5) = 100 and the minimum score (20x1) = 20 with an interval of 80. Table 2 presents the interpretation.

Table 2. Intervals of student motivation

Category	Classification
Always	≥ 84 - 100
Often	≥ 68 - 84

Sometimes	≥ 52 - 68
Rarely	≥ 36 - 52
Never	≤ 20 - 36

Data Analysis

The data analysis technique used in this research employs the "t" test with the assistance of the SPSS 29 application. To find out how much students' motivation increased before and after applying the game-based learning (GBL) technique in the IPAS course, hypothesis testing is done using the "t" test. The null hypothesis (H0) acceptance or rejection criteria at a 5% significance level are used to make decisions on the hypothesis. The hypothesis is accepted if the obtained significance value is smaller than the significance level value in the table.

Instrument analysis, specifically the questionnaire in this study, is tested using validity and reliability tests. This is done to ensure that the instrument becomes a valid and reliable measuring tool. Table 3 below displays the findings of the instrument validity test conducted using the questionnaire.

Table 3. Results of the questionnaire validation

No.	Statement	Significance	Explanation
1.	Statement 1	0.702	Valid
2.	Statement 2	0.746	Valid
3.	Statement 3	0.526	Valid
4.	Statement 4	0.567	Valid
5.	Statement 5	0.674	Valid
6.	Statement 6	0.718	Valid
7.	Statement 7	0.653	Valid
8.	Statement 8	0.626	Valid
9.	Statement 9	0.605	Valid
10.	Statement 10	0.644	Valid
11.	Statement 11	0.763	Valid
12.	Statement 12	0.694	Valid
13.	Statement 13	0.512	Valid
14.	Statement 14	0.671	Valid
15.	Statement 15	0.675	Valid
16.	Statement 16	0.695	Valid
17.	Statement 17	0.529	Valid
18.	Statement 18	0.756	Valid
19.	Statement 19	0.683	Valid
20.	Statement 20	0.625	Valid

With a significance threshold of 5%, the r table in the data validity test is 0,4044 because there are 24 participants. A significance value of 0,4044 or higher indicates that the data is valid, while a value of 0,4044 or less indicates that the data is invalid. The validity test results of the statements on the questionnaire sheet show a significance value greater than the r table. Therefore, all the statements are declared valid. Meanwhile, the reliability test result is 0.943, indicating that the statement has high reliability.

▪ RESULT AND DISSCUSSION

Students' motivation to learn can be assessed in this study by administering questionnaires before and after the test. Before using the game-based learning (GBL) approach, the pre-test questionnaire is administered. Following instruction utilizing the game-based learning (GBL) methodology, a post-test questionnaire is given. Students' opinions about game-based learning are much better compared to before treatment of game-based learning in IPAS lessons. The difference can be seen in Figure 1.

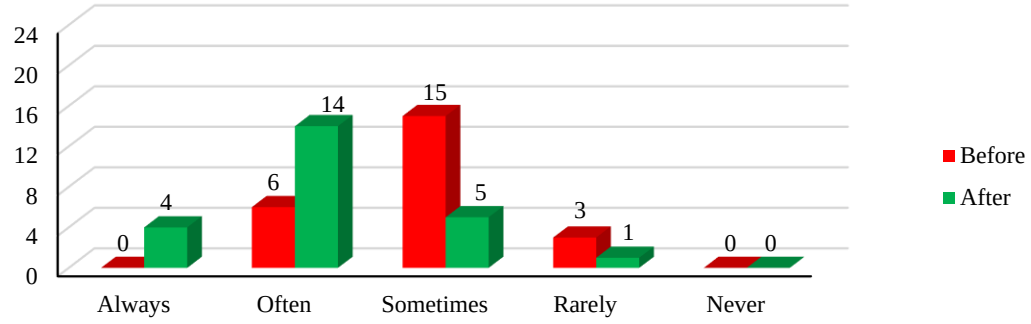

Figure 1. Data before and after the implementation game-based learning

Table 4 shows how students' average motivation changed before and after using the game-based learning (GBL) model.

Table 4. Results of the T-Test on students' motivation for learning

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	After Treatment	78.9167	24	9.88594	2.01796
	Before Treatment	58.1667	24	9.35143	1.90885

With N equal to 24, Table 4 displays the average learning motivation of students after treatment with the game-based learning model at 78,9167 and before treatment with the game-based learning model at 58,1667. The standard deviation after treatment of the game-based learning model is 9,88594, while 9,35143 is the standard deviation before treatment. After treatment with the game-based learning model, the standard error of the mean is 2,01796, whereas it was 1,90885 before treatment.

Table 5 shows the magnitude of the correlation value between students' learning motivation before and after implementation the game-based learning model.

Table 5. Results of the correlation of students' learning motivation

Pair 1		N	Correlation	Sig. (2-tailed)
	After Treatment Before Treatment	24	.821	<.001

The value of the correlation between the two samples is presented in Table 5, where the correlation value is 0.821. Through the Pearson Product Moment correlation, the scores of students' opinions in filling out the questionnaire about learning motivation, both before and after treatment of the game-based learning model, show a significance

value of 0,001, this suggests that the value falls below the significance level of 5%. Based on this data, the null hypothesis (H0) is accepted. Therefore, the data processing concludes that there is a significant relationship between students' learning motivation and the game-based learning model using IPAS quartet cards media. Table 6 below compares the learning motivation of students before and after implementation the game-based learning model.

Table 6. Comparative results of student learning motivation

Pair 1	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
After Treatment Before Treatment	20.7500	5.78040	1.17992	18.30915	23.19085	17.586	23	<.001

The T-test findings of the comparison study are shown in Table 6. With a standard deviation of 5,78040 and a standard error of the mean of 1.17992, the results indicate that the average before and after training with the game-based learning model is 20,7500. The smallest difference is 18,30915, while the largest is 23,19085. With 23 degrees of freedom and a significance value of 0,001, the t-test result is 17,586. Comparing the significance value to the 5% significance level allows for an interpretation to be made. The significance level, which is 0,001 < 0,05, is exceeded by the value. The study concludes that there is a significant change in students' perceptions of learning motivation before and after game-based learning using IPAS quartet cards as the media.

The analysis of the pre-test and post-test results from the students' learning motivation questionnaire indicates a notable improvement in students' opinions regarding their motivation before and after the implementation of the game-based learning model utilizing IPAS quartet cards. This enhancement resulted from the implementation of an innovative education model. Regardless of the t-test results, when teachers implement an engaging learning model and media, students will feel happy and their learning motivation will significantly increase. The emotional and intellectual well-being of students can be fostered when they are directly involved in game-based learning, thereby creating an enjoyable learning environment and encouraging the development of their potential (Farin Hanifatun Nuha & Kartika Yuni Purwanti, 2023; Pho & Dinscore, 2015). The implementation of game-based learning promotes active engagement among students in learning activities, fostering a sense of enjoyment and heightened enthusiasm for participation in the learning activities (Adnyani & Wibawa, 2021; Widiana, 2022). Game-based learning represents a learner-centered approach to education, facilitating the effective attainment of learning objectives (All et al., 2021). The game-based learning model has the potential to shift the learning paradigm from a teacher-centered approach to a student-centered one (Winatha & Setiawan, 2020).

According to constructivist learning theory, learning becomes more meaningful when students actively participate in the construction of their own knowledge. This theory highlights the importance of offering students the chance to assess and interpret the

conditions they have experienced on her own. Game-based learning is an innovative educational model that engages students in problem-solving activities and facilitates collaboration with other students, allowing them to construct their own knowledge. This educational model facilitates the creation of significant learning opportunities and promotes student development through enjoyable experiences of learning. This interacting learning experience will motivate students to actively participate in the learning process. When students' motivation to learn appears, their learning outcomes are likely to increase, as they will engage more deeply with the subject matter. Research indicates that the game-based learning model can improve students' motivation for learning and academic achievement, as well as enhance 21st-century skills (Qian & Clark, 2016; Widiana, 2022; Winatha & Setiawan, 2020). These findings correlate with other research indicating that game-based learning can augment knowledge, foster long-term memory, promote teamwork, and increase their communication skills (Dabbous et al., 2022). The integration of games into the process of learning offers positive effects, as students indicate improvements in motivation and learning outcomes.

In learning using the game-based learning model, the teacher acts as a facilitator and provides guidance to students who need assistance. Meanwhile, the students collaborate with each other to solve the problems that arise during the game. The application of the game-based learning model has been shown to significantly increase students' motivation for learning. This is supported by responses collected from students through a questionnaire, which indicates a noticeable difference in motivation levels between before and after the implementation of game-based learning activities. This is because the use of games in the learning process does not mean that students are free to game without direction and supervision. The use of games in the process of learning does not mean that students have the freedom to participate in play without instructions and supervision. Games have an important place in the world of education, as they provide students with a variety learning opportunities through enjoyable activities (Tobias et al., 2014). Especially elementary school students, they really enjoy learning through games. As a result, students are happy and motivated when participating in learning activities (Malamed, 2012; Partovi & Razavi, 2019). Games can be a fun learning tool for students because, simultaneously, this learning makes students relaxed, comfortable, and certainly affects the improvement of students' conceptual understanding (Andrew et al., 2019; Troussas et al., 2020).

The implementation of the game-based learning model stimulates knowledge of the relationship between science and technology in daily activities. Students can effectively utilize this implementation of game-based learning to enhance their understanding of science concepts, especially with concrete learning media. Understanding scientific concepts is very beneficial and applied by students in their daily lives so that students are aware of their role in preserving and conserving the natural environment and appreciating nature (Aiman & Amelia Ramadhaniyah Ahmad, 2020). Thus, the goal of science education is to shape students who possess excellent qualities.

Game-based learning can also utilize assistance in the form of learning media. This finding aligns with the opinion that the use of media can make learning more varied and the learning process clearer and more engaging (Kurniawati & Koeswanti, 2021; Saputri et al., 2022). Learning media greatly assists teachers in delivering educational material to students. This is in line with research findings that state when teachers are skilled in

creating and using learning media, students will benefit from it. Students gain advantages such as obtaining a deeper understanding of the material, actively engaging in the learning process, and perceiving learning as an enjoyable experience (Junaidi, 2019; Magdalena et al., 2021). As a learning aid, educational media can provide concrete experiences to students, thereby enhancing their absorption and retention in processing their own knowledge (Reid Chassiakos et al., 2016; Sargeant, 2015). The quartet cards are one of the media that may be employed in learning activities. These quartet cards are practical and easy to use everywhere. Additionally, the quartet card media can be played by students without teacher supervision. Card media can be used to support learning in schools that still face limitations in electronic facilities (Saputri et al., 2022).

The implementation of game-based learning can ultimately provide a stimulus for understanding and cognitive development, as well as increase students' motivation (Chen & Hsu, 2020). Another finding about learning using game-based learning adds that game-based learning can significantly increase student engagement (Krath et al., 2021). Game-based learning can also be described as a form of learner-centered education that can create an enjoyable learning environment, thereby achieving a balance between learning models, teaching methods, and appropriate learning media.

The findings indicate that utilizing a game-based learning model in the IPAS subject for 3rd grade at SD Negeri 2 Danguran, with the use of IPAS quartet cards, increases students' learning motivation. The use of quartet cards in learning activities enhances student participation and creates a joyful learning environment. Seeing the success of this research, the researcher hopes that the implementation of game-based learning model can be implemented in other subjects and learning materials that are constructed to the characteristics of this learning model. Researchers have identified the game-based learning model as an approach that enhances students' subject matter knowledge (Byusa et al., 2022; Moon et al., 2024). The game-based learning model needs to be further developed by integrating it with other learning media that are adapted to the times and the conditions of the school environment (Purwanti & Putra, 2022).

▪ CONCLUSION

After conducting research and analysis, we concluded that the implementation of the game-based learning model significantly improves the learning motivation of 3rd-grade students at SD Negeri 2 Danguran. The students' responses to the pre-test and post-test questionnaires for learning motivation indicate an increase. Implementing an innovative and interactive learning model for students, specifically through a game-based learning model utilizing IPAS quartet cards, led to this increase. The results of the students' learning motivation scores indicate that the null hypothesis, which states the difference between scores before and after the treatment, can be accepted. The average scores of students' responses show differences before and after the implementation of the game-based learning treatment. The average score of students' responses after the treatment is better than the average score of students' responses before the treatment. The influence of this learning model on the learning process increases student motivation to minimize boredom and create enjoyable learning experiences, as well as enhance students' engagement in participating in the learning. In learning, positive appreciation also needs to be given as a form of praise to students who succeed as well as those who

have made an effort, serving as motivation to achieve the learning objectives desired by the teacher.

Based on the findings and conclusions presented, it is recommended that future research focus on similar topics but adapted to the current era in order to explore more deeply the use of game-based learning models with different subjects. Researchers are also advised to use samples from various grade levels to obtain more diverse data. Teachers can use a game-based learning model with quartet cards media or other media to enhance students' understanding of a learning material and their engagement in the learning process. Teachers can also use a more varied learning model to make students enthusiastic and improve their academic performance. Hopefully, this research can serve as a reference in similar studies.

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