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EFFECTIVENESS OF SCIENCE CARD GAME ON EXCRETION SYSTEM TO HUMAN MATERIALS TO IMPROVE STUDENT COGNITIVE LEARNING OUTCOMES

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Abstract

This study aims to describe the effectiveness of the Science card game to improve student learning outcomes. This type of research is the development using the Research and Development (R&D) model. The research design used was a one-group pretest-posttest design conducted on 32 students of class VIII-F of SMPN 50 Surabaya. The results of the effectiveness study were reviewed through two aspects: student learning outcomes and student questionnaire responses. Student learning outcomes can be reviewed from the results of the pretest and posttest. Obtained the average results of student pretest of 50.00 and the average posttest results of 84.79. Obtained an increase of 100% with details of 62.50% of students or as many as 20 students get an increase with a moderate category, and 37.50% or as many as 12 students get an increase in the high category. The average N-gain score was 0.68 in the medium category. Then the results of student responses showed an average of "Yes" answers of 96.31% and "No" answers of 3.69%. Based on the two results, the media game Science card game is considered effective for improving student learning outcomes.

Keywords: *Effectiveness, Science Card Game, and Student Learning Outcome.*

INTRODUCTION

The change of curriculum in Indonesia to the 2013 Curriculum influenced the learning process. The implementation of learning by using the 2013 curriculum is more student-centered, so students are required to be more active and teachers are required to provide more meaningful learning for students so students can be motivated in the teaching and learning process. Learning activities in educational units are held interactively, inspirative, fun, challenging, motivating students to participate actively, as well as providing sufficient space for the initiative, creativity, and independence by their interests, and talents as well as the physical and physiological development of students (Permendikbud number 22 of 2016). The teaching and learning process becomes easier for students to accept if learning can be made to be interesting and innovative so that students can be motivated and student learning outcomes improve (Machin, 2012).

One effort to develop innovative learning can be through the use of instructional media. Media itself is something that can be used as a source to channel thoughts, feelings, attention, and willingness to learn (Fathonah, 2016). The use of media in the learning process is as a form of channeling sources of information which in the learning process is from teacher to student. The use of media in the teaching and learning process makes students interested in the material being taught, as well as the different methods of delivering information from teacher to student because the teacher does not only speak the material but can also be interspersed with activities that can motivate students to actively participate in a learning activity. Therefore we need media that can motivate students so students can improve their learning outcomes.

Many media can be used in the learning process in the classroom, one of which is to use games. According to Sadiman (2010) in (Zulianto, 2016) as an educational medium, the game has several advantages namely the game is something fun to do and something entertaining, the game allows active participation from students to learn, the game can provide direct feedback, the game can teach reading skills; write; and communication indirectly, and games can be easily made and reproduced. One type of game that is suitable to be applied in the learning process is to use card games.

Learning outcomes in the field of knowledge can be known through student achievements in carrying out the National Examination. There are 4 subjects tested, one of which is a science subject. On natural science subjects obtained by Surabaya 50 State Junior High School in 2019, the average results were 55.11 (Kemendikbud, 2019). From these results, the value of natural science subjects is still relatively low compared to other subjects tested. Based on the results of interviews that have been conducted to science teachers at SMPN 50 Surabaya, the material on the excretion system in humans contained in KD 3.10 is classified as difficult. That is because of the lack of student motivation in reading, teaching materials provided are too simple, there is still a lack of learning methods that can attract students 'attention and a lack of learning media that attracts students' interest in learning science. This causes learning to be less meaningful for students so that student learning outcomes in the field of knowledge are still less satisfying. KKM or the achievement of the minimum value in Surabaya 50 State

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Junior High School for natural science subjects is 77. Based on the results of interviews that have been carried out as many as 70% of students on the excretion system material that has grades below the KKM value and only 30% of students who have exceeded the KKM value.

In this study, the researchers conducted a pre-study by distributing questionnaires to students of class VIII F at SMPN 50 Surabaya. Based on the results of the questionnaire that has been distributed as much as 94.78% of students consider science lessons to be classified as moderate. Then as much as 82.05% of students stated that the material in the human excretion system was classified as difficult material. This is consistent with as many as 70% of students whose grades are still below the KKM and based on the results of the IPA teacher interviews that the lack of interesting media is one of the less meaningful learning factors for students. Then as much as 87.18% of students liked to play while learning. That is because learning will not get boring quickly, the atmosphere does not become tense, and the concepts conveyed will be easier to understand. Learning activities carried out while playing can provide opportunities for students to find concepts independently as well as understanding on a material. So that when students feel happy, the learning information will be more easily accepted by students. As many as 60% of students stated that playing media using cards can help students find concepts, understanding and can improve student learning outcomes.

According to research conducted by Zulianto (2016) with the title "The Eligibility of Adventure Card Games as Learning Media on Human Excretion System Material," this study uses a type of research development with the Research and Development (R&D) research method. This study was tested on 16 eighth grade students of SMPN 32 Surabaya. The research design used was One Group Pretest posttest design. The validity of this study was 3.72 with very good criteria. Then the practicality obtained a value of 3.62 with very good criteria. Then the effectiveness of this media is shown by the classical completeness of students by 100% with an increase in student learning outcomes by 31.25% students experienced a high increase and 68.75% of students classified as experiencing a moderate increase.

Then based on the results of a study conducted by Muwarningsih (2016) entitled "Development of Natural Science Box Game on Material Excretion System as a Student Learning Media in Middle School" this study uses a 4D development model (Define, Design, Develop, and Disseminate). The trial design used in this study was one group pretest-posttest design. This research was conducted on 16 students of class VIII B, SMP Negeri 51 Surabaya. The results of this study are shown with the acquisition of validity by 93% with a very valid category. Practicality, the result is 96.48% with a very practical category. Then the effectiveness of this study is shown by the results of classical completeness obtained in the amount of 87.50% and declared very effective. Then the

‘]average result of N-Gain obtained a result of 0.6 which is included in the moderate category increase.

In a study conducted by Machin (2012) with the title "The Effect of Call Card Games on Learning Outcomes and Biological Learning Activities" using experimental research methods, pretest-posttest control group design in which there are two classes used as research subjects. The first class is used as an experimental class by giving Call Cards a card game in the learning process, while the second class is used as a control class which only uses group discussion. The results obtained that the study group has a high average learning outcome. Then the results of observations of individual student activities are also classified in the high category as well as the results of the teacher's performance evaluation.

In its application to the learning process of the media game Science, the card game has several learning theories such as the theory of behaviorism which in this theory there are repetitions and training so that the expected behavior can become a habit that is mastered (Anggraeni, 2017). From this theory the game Science card game media applies questions that can be used for quizzes in learning so that later students will get used to questions about the excretion system and can improve their learning outcomes. Then there is another theory, Piaget's, which represents constructivism. In this theory, students can find or build their concepts based on the activities or activities provided by the teacher (Permata, 2018). In learning by using the media game Science card game is students must actively seek answers to questions on the card. Students actively search for information, analyze data or information obtained so students can understand concepts and improve learning outcomes. The next theory is Vygotsky's theory which in this theory emphasizes the importance of a person's active role in constructing his knowledge so that one's cognitive development is determined by the individual but also by his active environment (Permata, 2018). In its application students can look for answers by discussing with a group of friends to form cooperation in groups and students can exchange opinions so that they can form concepts about the excretion system. Then the theory of information processing that refers to the processing of receiving information stored in long-term memory, therefore active strategies that involve students in learning to play a role in students' long-term memory (Slavin, 2011). Applications in learning using game media Science card games are cards in this game containing material that is used as reinforcement and repetition in the excretory system material.

The game media Science Card Game will be tested for its effectiveness in the learning process. The effectiveness of this media can be seen from the results of written tests conducted by students in the form of pretest and posttest as well as the results of student questionnaire responses to the Science Card Game. In previous studies, the game media Science card game contained components such as cards, board games, and game dice. In this media cards that are expected to become learning media have two types, namely type A and type B.

Where type A has questions with short answers, and type B has more complex and long answers. On card A and card B, there will be questions with different question levels according to the stages of the cognitive domain

(C1 - C4), so questions will be more varied and challenging for students. In addition to these types, this card also implements a system of UNO cards, namely by adding some additional cards on the Uno card as entertainment so that students are more eager to play cards and motivated to increase scores. The advantage of this game media is that the cards used have two different types, namely card A and card B, where each card has a different level of questions that can be used to test the understanding of concepts that have been accepted by students. This media also functions as a form of strengthening the concept of the excretory system material. Another difference is the location of the research conducted, namely at SMP Negeri 50 Surabaya based on the results of interviews and pre-research conducted.

RESEARCH METHOD

In this study using data collection methods in the form of written tests using pretest and posttest question instruments. The form of the questions used is a multiple choice question of 15 questions. The targets of this study were 32 students from Surabaya 50 Public Middle School. The research design used was a pre-experimental design research design, with the design used was One group pre-test and post-test design. The initial research was conducted by giving a pre-test to identify the students' initial abilities, then proceed with the treatment in the form of the implementation of the Science Card Game, then students were given a post-test to find out the increase in student learning outcomes.

Pre-test	Treatment	Post-test
O_1	X	O_2

Information:
O_1: Pre-test Score (before treatment)
X: variable treatment with Science Card Game
O_2: Post-test Score (after treatment)

The data obtained in this test are in the form of data on the results of the pre-test and student post-test which are then categorized according to the KKM applicable at SMPN 50 Surabaya. based on the KKM criteria students are declared complete if they get a grade of ≥77. Then analyzed using the normalized gain score with the formula:

$$< g >= \frac{SPosttest - SPretest}{SMax - SPretest}$$

Information:
<g> : Gain Score
Sposttest: Posttest student score
SPretest : Student's Pretest Value
Smax : The maximum value of the test

Then the results of the gain score are classified according to their categories. The classification of gain according to Hake (1999) is as follows:

Table 1. N-Gain Range Categories

Gain Score	Categories
g > 0.7	High
0.7 > g > 0.3	Medium
g < 0.3	Low

(Hake, 1999)

Based on these criteria the game media Science card game is considered effective for improving student learning outcomes if it gets a score of ≥ 0.3 in the medium category.

In addition to using the written test method, the effectiveness of the use of the Science Card Game media can be reviewed through questionnaire responses distributed to students. The percentage of data obtained using the Guttman scale calculation, the answer "Yes" gets a score of 1, and the answer "No" gets a score of 0. Then the percentage of data is calculated using the formula:

$$(\%) = \frac{the\ number\ of\ student\ in\ each\ aspect}{total\ number\ of\ students} X\ 100\%$$

Then the results of the percentage were categorized according to the following table:

Table 2. Interpretation criteria of student responses scores

Percentage (%)	Categories
0-20	Very ineffective
21-40	Ineffective
41-60	Effevtive enough
61-80	Effective
81-100	Very effective

(Adaptation: Riduwan, 2013)

Based on the criteria in the table, the student response is said to be good if all aspects of the questionnaire get a percentage of ≥61% with effective criteria.

RESULT AND DISCUSSION

A. Learning Outcomes

The effectiveness of the game media Science card games can be reviewed based on the influence of the game on student achievement in the learning process. The intended outcome is student learning outcomes. Improved student learning outcomes obtained through the pretest and posttest sheets were tested on 32 students then analyzed using the N-Gain test.

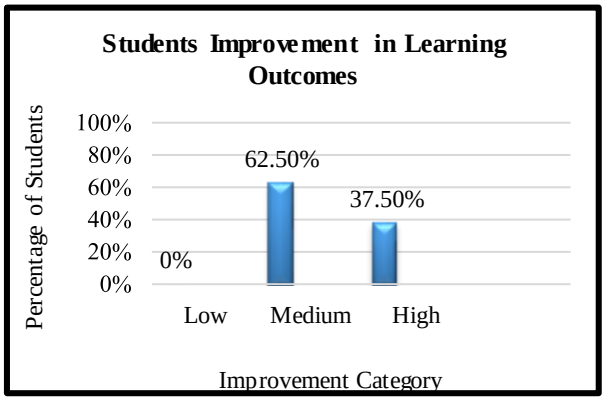
Based on the average pretest and posttest results, there was an increase before and after learning by using the Science card game media. This can be seen through the average results obtained for the pretest results obtained at 50.00 and the average posttest results obtained 84.79 results. From the two tests seen a significant increase in student knowledge learning outcomes. A game media developed can be said to be effective if it has a gain score of ≥ 0.3 with a moderate increase category (Hake, 1999).

Table 3. Gain Category

No.	Gain Category <g>	Total Students	Percentage (%)
1.	Low	0	0
2.	Medium	20	62.50

3.	High	12	37.50

Based on the N-gain Category data table above there are several criteria or categories. The number of students in the low category is 0 students or there is no increase in student learning outcomes in the low category. Then for the increase in gain with the medium category, there are 20 students which means the gain score obtained is 0.7> g> 0.3. Then the high category of 12 students, which means as many as 12 students get a gain score of more than 0.7. Based on the criteria for increasing student learning outcomes knowledge obtained an overall average increase of 0.68 with the category of moderate gain increase. Improved student learning outcomes based on the N-gain test category can be seen in the following graph.



Picture 1. Graph of Improvement Students Learning Outcome

Based on the graphic improvement of student learning outcomes above it is known that as much as 100% of students have experienced an increase in learning outcomes in the material excretion system in humans. There are three categories of gain increase, namely low, medium, and high. At low gain increase results obtained 0%, which means that no students have experienced a low increase. Then the moderate gain increase was 62.50% of students who experienced an increase. For the increase in the high category, there were 37.50% of students. These results indicate that the increase in student learning outcomes reached 100%.

The effectiveness of a learning media can be reviewed through the achievement of the results of learning objectives. Based on the opinion of Sudjana and Rivai (2010) which states that the use of instructional media is not only seen in terms of its sophistication but also its function and role in helping to improve the process of learning outcomes. In this study, the aim to be achieved is to improve student learning outcomes knowledge. Increased student learning outcomes knowledge reached 100%, so it can be said that 32 students who have been tested have increased overall. The increase obtained based on the results of the N-gain test is the medium and high categories. The increase was detailed with 22 students experiencing a moderate increase, and 10 students having a high increase. In the calculation of the N-gain test also obtained an average result of 0.68 with the category of moderate increase. The condition of a media can be said to be effective in the learning process is if the media get a score ≥ of 0.3 in the medium category (Hake, 1999). This proves that the media game Science card game is said to be effective for improving student learning outcomes.

The increase that occurs in student learning outcomes can be influenced by several factors. One of them is repetition. In its use, the media game Science card game is used as a repetition of material by inserting questions on the card used to play. This causes students to continue to do a repetition of material, in which repetition of the material is provided in the form of questions that exist on the Science card game. This is following the opinion of Hamalik (2004) which states that something that has been learned must be used practically and do repetition continuously so that mastery of learning outcomes becomes more stable. Another factor that causes an increase in student learning outcomes is the presence of students' interest in using the media game Science card game. In practice learning, by using the media game Science card game is not just conveying material through verbal, but students are also invited to participate in the process of playing at the end of learning. Increasing student learning outcomes by using the media game Science card game supported by the opinion of Muwarningsih (2016) which states that the use of game media can improve student learning outcomes in terms of its effectiveness in the learning process. Also, according to Zulianto (2016) in his research stated the use of instructional media effectively improves student learning outcomes.

The effectiveness of improving student learning outcomes in addition to being viewed in terms of classical completeness can also be viewed from the N-gain test. In this N-gain test, there are three categories: low, medium, and high. Based on the results of the N-gain test that has been done there is an increase in student learning outcomes in the medium category by 20 students or if presented at 62.50% students in the class have increased in the medium category. Then as many as 12 students or 37.50% of students experienced an increase in the high category. This means that most of the material packaged in the form of questions on the card delivered to students properly. In this study, the game media Science card game is a two-dimensional graphic media, which contains symbols, pictures or illustrations, and data in a table. In the opinion of Ibrahim (2010) states that the use of graphic media can activate the students' sense of sight to increase student attention. So if students pay attention and interest in the learning media, students will focus on the material that causes learning to be more meaningful and student learning outcomes also increase. This is following the opinion of Arsyad (2013) which states that using image media has an important role in the learning process, namely

students can facilitate understanding and strengthen their memories.

An increase in student learning outcomes after using the media game Science card game is also caused because the game Science card game is a game between individuals in a group. In this case according to Sadiman (2010) states that the game causes active participation from students. This is following research conducted by Su Tzufen (2014) which states that learning by using educational card games is effective to help improve and elaborate students' understanding of a concept by incorporating a concept into the rules of the game so students can use strategies and exercises who repeat to win the game.

In this case, the game Science card game requires students to answer the questions on the question card, if the answer is deemed not right, then the question will be thrown to other players. This causes the communication process that occurs between individuals in a group so that the learning process will feel active and interaction between students will be felt more prominent. The game will make classroom conditions or situations fun, not tense, and students don't get bored quickly. In its application in the classroom game activities using the media game Science card game helps students to find concepts and repeats the concepts that have been explained with the help of question cards on the Science card game. This can cause students to form new concepts or strengthen the concepts they have acquired. This is following the opinion of Anggraeni (2017) which states that learning activities while playing provide opportunities for students to manipulate, repeat, find themselves, and get a variety of concepts and understandings. Fun learning is learning that can be enjoyed by students so students feel safe, comfortable, and fun. According to Jahuar (2011) the fun and pleasant feelings that form in students cause students to be motivated to find out something. This is following the opinion of Hamalik (2004) which states that there are factors of interest and effort that encourage students to learn. In this case, the appearance and how to play the Science card game is made as attractive as possible so that it can attract the attention and interest of students to study science material deeper. The cause of the increase in learning outcomes that occur in students after using the media game Science card game is that this game is used as a reinforcement of material that has been received by students. Reinforcement of the material in question is the existence of repetition of material in the form of questions that must be answered by students when playing. The existence of this repetition makes students able to better understand the material and master the material. This is following the opinion of Anggraeni (2017) based on the theory of repetition behaviorism and training is given so that the desired behavior can become a habit that is mastered by individuals. A teacher is required to provide creative teaching than usual so that the information conveyed during learning will be remembered by students and entered into students' long-term memory. Also, repetition is also needed as a reinforcement to students so that information is not easily forgotten. Applications in learning using game media Science card games are cards in this game containing material that is used as reinforcement and repetition in the excretory system material. This is following the opinion of Slavin (2011) which states that active learning strategies in involving students in the learning process play a role in influencing students' long-term memory.

Based on these results it can be seen that the media game Science card game is effective in improving student learning outcomes.

B. Students Responses

The effectiveness of this research can be reviewed from the results of the questionnaire responses that have been filled out by students to determine student responses after being given a Science card game on their learning. This questionnaire is also used to find out the ease of use of the game Science card game. The questionnaire was distributed to 32 students consisting of 4 objectives with 11 questions. A game media can be said to be effective if it has a value of ≥61%, which means it must get a positive score of 61% -80% with effective criteria and 81% -100% with very effective criteria (Riduwan, 2013). Based on the data obtained for each question the response of students is quite positive, which can be reviewed from the results of the score for each question that can be categorized in very effective criteria. Then the average obtained from the results of student responses was 96.31%, which means that the media game Science card game can be categorized very effectively.

The first objective in the student response questionnaire is to describe students' interest in the Science Card Game. In this first objective, two questions contain the pleasure of using the media game Science card game and this game can increase enthusiasm in learning science. Each of the two questions gets a score of 100% with a very effective category. Based on the results of student response scores on this goal shows that students are interested and feel happy when playing using this Science card game. This is following the opinion of Jahuar (2011) which states that pleasant learning can be created by providing a pleasant environmental situation so that students will have a more comfortable feeling to learn, and the delivery of material in a variety of ways can attract student motivation to learn. This is also supported by research conducted by Tsai (2020) which states that as many as 16 students who use educational games have higher post-test scores, in which the understanding of concepts received by students also increases. Then the results of a study conducted by Spandler (2016) stated that more than 89% of students felt that playing cards on mineralogical

material would greatly assist learning and 88% of students stated that they agreed if there were group game activities that lead to improved learning outcomes. In the Science card game media games, students are grouped to play with their groups each of them will create a pleasant atmosphere that can motivate students to answer questions and students can have discussions with their groups to get answers.

The second goal is to describe the attractive appearance in the Science card game. In this goal, there is only one question that is about the appearance of an interesting Science card game that gets a score of 96.88% with a very effective category. The appearance of the game media is also related to the function of the media. One of the functions of the media is to clarify the presentation of the message so as not to be too verbalises, as well as overcome the limitations of space, time, and senses (Sadiman, 1993). In media game Scienece card game display cards used are made as attractive as possible while still paying attention to aspects used to make media. Then in the Science card game not only contains question writing but some images support the question so that students can clearly grasp the concept of the question and can answer it correctly. According to Saud (2009) there are several principles for making media, one of which is a variation that has a role to make students able to participate and be active in the learning process. The display made in the media game Science card game is varied by adding elements of photographs or images so that students can encourage active attitudes of students and students can easily grasp the intent and purpose of the questions on the card. When students are interested in the appearance of the media of the game will arise a curiosity for students, so students will try the game. This is following the opinion of Saud (2009) which states that the contents of a media that is designed by the principles of making media, the media can be said to be of quality and foster a sense of interest for students to learn by using media.

The third goal is to describe the clarity of game card game Science. In this goal, there are four supporting questions, namely about the rules of the game, how to play, the questions of the media game Science card game, and the language used in the media game Science card game. In the first question about the rules of the game in Science card games get a score of 100% and included in the category of very effective. In the media game Science card game some rules are made so that the game can be understood by students. According to Sadiman (2010) a game is every contest between players who interact with each other by following certain rules to achieve certain goals. Then the second question about how to play that gets a score of 100% with a very effective category. A game has its way of playing, it is made so that players who follow the game can easily understand how to run and do the game so that the game can be carried out properly. Rules and guidance on how to play are made so that players can achieve the expected goals. The third question is in the form of convenience questions in the media game Science card game which scores 87.50% with a very effective category. This is in accordance with the opinion of Sudjana and Rivai (2010) which states that the use of media in the learning process is not assessed by its sophistication but its function and role in helping to improve student learning processes and outcomes. In this case, the purpose of making the media game Science card game is to help students improve their learning outcomes. One of the principles that must be considered in selecting media is the existence of an appropriate principle. According to Saud (2009) appropriate means the learning media used by basic competencies. In this case, the media game Science card game consists of cards containing questions by basic competencies in the material of the human excretion system for students of class VIII SMP. The questions are made based on indicators that have been developed from basic competencies and have several stages of different levels according to the cognitive level for junior high school students namely from C1-C4. This is following the opinion of Saud (2009) which states that the media for education and teaching must be developed under the level of thinking of students so that the meaning and information contained in a media can be well understood by students. Improving student learning outcomes can be done by practicing the questions contained on the card in the media game Science card game. A media must contain information that must be understood by students, in this case, the information contained in the media game Science card game is made in the form of questions about the material of the human excretion system which later must be answered by students. This is following the opinion Muwarningsih (2016) which states the information in the game can be packaged in the form of questions about material. Then the fourth question is the aspect of the language used in the game Science card games get a score of 96.88% which can be categorized very effectively. This shows that the language used in the media game Science card game matches the age level of students so that the media game Science card game can be easily understood. This is following cognitive development according to Bruner. Bruner in Hafiyannisa (2016) states that there are three stages of a person's cognitive development, namely: Enactive, Iconic, and Symbolic, which means someone can have abstract ideas or ideas that are influenced by language and logic skills. In this case, the language used in the game Science card game influences the cognitive development of one's learning and learning outcomes.

The fourth objective is to describe the game of card games as learning activities for students. In this goal, there are four questions. The first question is

about the game Science card game makes students increasingly understand the excretory system material that gets a score of 90.62% with very effective criteria. Then the second question students can be actively involved in learning while using the Science card game with a score of 90.62% with very effective criteria. The third question is students feel happy when answering questions in the game Science card game by discussing in groups that get a score of 96.88% with very effective criteria. The fourth question is about students being able to accept if winning or losing while playing get a score of 100% with very effective criteria. Of the four questions refer to the game Science card game as part of student learning activities. In this case, learning by using media games will make students feel happy. This feeling of excitement can motivate students to improve their learning outcomes. This is following the opinion of Darmansyah (2010) which states that a fun learning strategy is used to create an effective learning environment, can implement curriculum, deliver material, and facilitate the learning process. Someone will more easily accept the information conveyed by the teacher if the conditions or situations in learning are made fun because students can be motivated and make students not get bored quickly with the material explained by the teacher.

Based on all aspects and objectives of the student response questionnaire, the media game Science card game showed a positive response. This is based on the average results obtained which is 96.31% with very effective criteria. The results obtained indicate that the media game Science card game is very effective when used in a learning activity to improve student learning outcomes.

CONCLUSION

Based on the description of the research results above, it can be concluded that the media game Science card game to improve student learning outcomes is said to be effective based on two aspects, namely the learning outcomes of student knowledge can be reviewed from the results of the pretest and posttest. Obtained the average student pretest results of 50.00 and the average posttest results of 84.79. Obtained an increase of 100% with details of 62.50% of students or as many as 20 students get an increase with a moderate category, and 37.50% or as many as 12 students get an increase in the high category. The average N-gain score was 0.68 in the medium category. The results of the student questionnaire responses were stated to be very effective with an average result for each aspect of 96.31% for the answer "Yes" and 3.69% for the answer "No".

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