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Development of Interactive Edugame Learning Media Based on Quartet Cards on Material on Changes in the State of Matter

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Abstract: Teachers have not been optimal in varying interactive and concrete Edugame-based technology learning media. This study aims to describe the development design and test the feasibility and effectiveness of Quartet Card-based Interactive Edugame learning media for grade IV students of SDN Pesantren, Semarang City. This type of research is Research and Development (RnD) with the Borg and Gall model. The subjects of the study were 30 grade IV students of SDN Pesantren. Data collection techniques used tests (pretest and posttest) and non-tests (observation, interviews, questionnaires and document data). Data analysis techniques used normality tests, t-tests, and N-Gain tests. The results of the study showed: (1) Quartet Card-based Interactive Edugame Learning Media was developed using the Canva application with Quartet Card box components, instructions for using Quartet Cards containing the competencies achieved, main cards inserted with barcodes and modified cards in the form of boom cards containing questions as rewards and punishments; (2) The results of the feasibility of the material experts were 92.5%, media experts were 90%, teacher responses were 100% and student responses were 100% in the very feasible category; (3) The effectiveness of the Quartet Card-based Interactive Edugame learning media was shown by an increase in pretest and posttest results of 36.79%, supported by the results of the paired sample t-test with a sig. value. (2-tailed) <0.001<0.05, which means there is a significant difference, and the results of the N-Gain test were 0.778 in the high category. The conclusion of this study shows that the Quartet Card-based Interactive Edugame learning media was successfully developed, feasible, and effective in improving the learning outcomes of class IV students of SDN Pesantren Semarang City on the material of changes in the state of matter.

Keywords: Changes in the State Of Matter; Interactive Edugame; Quartet Card; Learning Media; Learning Outcomes.

Introduction

Ideal science learning at this time must be able to actively involve students in aspects of knowledge, attitude and skills [1]. Learning can be designed by integrating technology, varying learning media, and implementing simple practicums to support students' problem-solving abilities. Teachers can use learning media interspersed with Interactive Edugames and concrete in nature to attract students' interest in learning. In addition, direct experiments through simple practicums are an alternative to improving students' problem-solving abilities. In the independent curriculum, learning can be designed based on learning achievements, one of which is in the subject of *IPAS*, especially science material [2].

IPAS is a science that studies living and non-living things in the universe and human life as individuals and socially [3]. Elements in *IPAS*, especially science, consist of science understanding and process skills. To achieve the aspects of science learning, teachers can use learning media that contain a variety of stimuli in the form of images, text, videos, and games that are concrete, as well as the use of technology in the media used. This aims to enable students to develop an understanding of scientific concepts of science. [4]. Meanwhile, in the process skill element, teachers can design simple practicums in science learning. Practical activities can be developed by manipulating variables to train students' process skills, such as observing, communicating data, and communicating results.

The scope of science material in class IV includes the characteristics of living things, forms of matter and their changes, energy and its changes, electricity and magnetism, forces and changes in time, weather and seasons. Change in state of matter. This material discusses how substances can change from their original form to another form, such as from solid to liquid or from liquid to gas, without changing the type of substance [5]. Changes in the state of matter consist of melting, freezing, sublimation, condensation, evaporation, and crystallization. In this material, it is necessary to emphasize changes in the state of matter itself, namely changes in temperature and heat received by an object, so that students better understand examples of changes in the state of matter in everyday life [6].

Science is one of the abstract subjects. In the material of changes in the state of matter, simple practicums need to be carried out by students to prove and observe changes in temperature and heat experienced by an object because these changes do not occur directly. Activities proven through practicums can be improved by manipulating variables to facilitate the development of attitudes. This is also adjusted to the nature of science, namely science as a process related to practicums carried out by students, science as a product related to observation results, and science as an attitude related to students' attitudes during practicums. To facilitate students in visualizing science concepts into reality,

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variations are needed between technology-based learning media and game-like concrete media (Interactive Edugames).

In its implementation, students' ability to solve problems in science learning is relatively low. The results of the 2022 PISA survey on science literacy obtained a score of 415 from an average OECD score of 489, ranking 62 out of 81 countries [7]. The results show a decrease in the score of 21 points compared to the results of the 2018 PISA survey, with a score of 436 [8]. Therefore, science learning needs to improve because students need the ability to read and understand problems. Based on this, teachers must be able to vary the media and learning models as learning support to improve student learning outcomes.

Based on the results of pre-research through observation activities, questionnaire interviews and document data at SDN Pesantren Semarang City on October 10, 2024, several problems were found in the process of implementing science learning with the material of changes in the state of matter in class IV SDN Pesantren Semarang City, including teachers who have not been optimal in using technology-based learning media that are interspersed with concrete Interactive Edugames. Teachers only focus on technology-based learning media but have not used concrete learning media. Teachers must use engaging learning media to increase students' learning motivation [9].

Teachers have not been optimal in implementing innovative problem-solving-based learning models, including the Problem-Based Learning (PBL) learning model. This is evidenced by the syntax used by teachers, which is still not optimal; namely, in syntax 1, there are no examples of problems that students in learning must solve. Teachers can provide stimulus variations in videos containing case studies of problem-solving related to the material. In Syntax 2, teachers still coordinate students based on learning achievement. Each student has different interests in each subject, so teachers can divide and coordinate students based on the initial assessment before learning. In Syntax 4, teachers have not provided feedback or reinforcement to students in groups regarding LKPD. Teachers must give feedback to ensure that each student understands the results of simple experiments in LKPD well. Teachers must also use learning models adjusted to the student's character. Learning models must be by their syntax so that learning can run effectively [10].

The results of the cognitive diagnostic assessment of students on the material of changes in the state of matter are still relatively low, namely 73.5% or 17 students have not been able to meet the KKTP set by the school, namely 80. This occurs because of misconceptions experienced by students. Misconception is an error in interpreting a concept, information or idea due to the gap between the information understood and the correct information [11]. This will have an impact on student learning outcomes. In this study, there was a misconception about changes in the state of matter and the presence of foreign terms such as sublimation, crystallisation, condensation and evaporation that were new to students. Based on the existing problems, improvements are needed in science learning. These efforts include teachers needing to present technology-based and concrete learning media in Interactive Edugames. The press can contain images, videos, audio, text, and barcodes. Teachers can implement learning by presenting technology-based learning media interspersed with Interactive Edugames based on local wisdom, one of which is using concrete Quartet Card games. This is the opinion of (Putri A, 2022), who stated that using Quartet Card media can make it easier for students to understand the concept of changes in the state of matter [12].

Quartet Card learning media is a card that contains pictures and short descriptions [13]. With this, students become more interested in reading and analyzing the material on changes in the state of matter. In addition, the Quartet Card game can facilitate students' critical thinking skills. This is supported by adding challenge cards, such as boom cards that contain HOTS-level questions in text, images, or videos as barcodes. The variation of stimuli on the Quartet Card will increase students' curiosity [14]. Using Quartet Card learning media varies with the Problem-Based Learning learning model, which can also improve students' problem-solving abilities so that ideal science learning can be achieved and learning outcomes will increase.

The Quartet Cards developed were effective for use in learning with a percentage of 86% [15]. The conclusion that the Quartet Card affects learning outcomes by 15.3%. The difference between this study and the other is the product specifications and materials developed. If previous studies only made Quartet Cards in general, researchers modified Quartet Cards by adding themes and sub-themes with stimulus variations in the form of images and learning media barcodes that can be accessed via mobile phones. Researchers also modified the game by adding Boom Card with 3 different stimulus variations in text, images, and videos in the form of barcodes used when students incorrectly shoot the main Quartet Card card. With this modification, more students in each group can play the Quartet Card, and learning will be more exciting and enjoyable.

The development of Interactive Edugame Learning Media based on Quartet Card developed by researchers has an innovative novelty related to the Interactive Edugame learning media based on Quartet Card in the subject of science for grade IV with the material of changes in the state of matter, including the use of the Problem-Based Learning (PBL) learning model, the use of self-made learning videos, the existence of simple practicums, the use of game-like technology in the Quartet Card media and the use of HOTS questions with KKO analysing, proving, and concluding on the modified Boom Card card as a reward and punishment so that it can improve student learning outcomes. This study aims to describe the development design and test the feasibility and effectiveness of the Interactive Edugame learning media based on Quartet Card to improve cognitive learning outcomes in science for grade IV students of SDN Pesantren Semarang City.

Research Methods

This type of research is Research and Development (R&D). It can produce certain products and test their effectiveness [16]. Researchers use the Borg and Gall model proposed by Sugiyono (2019), which has 10 stages of development. The ten stages can be seen in Figure 1 below.

In the ten stages of development, researchers only used nine stages up to the trial usage based on the time and cost limitations of the researcher. The nine stages are 1) potential and problems, 2) data collection, 3) product design,

4) design validation, 5) design revision, 6) product trial, 7) product revision, 8) trial usage, and 9) product revision.

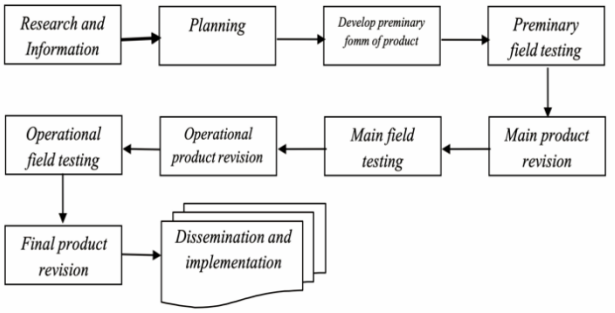


Figure 1. Borg and Gall's Research Design (Sugiyono, 2019)

This research was conducted at SDN Pesantren Semarang City in the odd semester of the 2024/2025 academic year, with the research subjects being 30 fourth-grade students of SDN Pesantren Semarang City. The researcher used 6 students as product trial subjects and 24 as usage trial subjects. In this study, the researcher used two data collection techniques: the test technique, which consisted of pretest and posttest, and the non-test technique, which consisted of observation, interviews, questionnaires, and document data. The initial data analysis technique the researcher used was the normality test, and the final data analysis was carried out using the paired sample t-test and N-Gain.

Results and Discussion

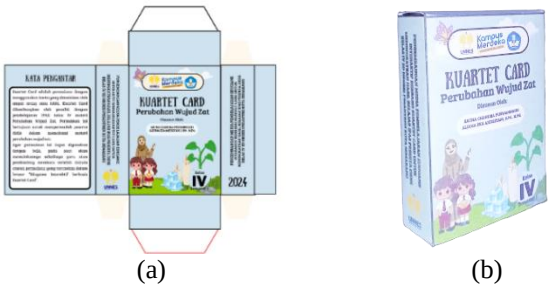
The product produced in this study is an Interactive Edugame learning media based on Quartet Cards in the subject of Science with the material of changes in the state of matter for class IV of SDN Pesantren Semarang City. The results of this study include (1) the design of the Interactive Edugame learning media based on Quartet Cards, (2) the feasibility of the Interactive Edugame learning media based on Quartet Cards, and (3) the effectiveness of the Interactive Edugame learning media based on Quartet Cards.

Development of Interactive Edugame Learning Media based on Quartet Card

This development research was conducted using the Borg and Gall model. The first stage is the analysis of potential problems. In analysing the potential issues at SDN Pesantren Semarang City, researchers conducted observation activities on learning, interviews with grade IV teachers of SDN Pesantren Semarang City, distributing questionnaires and documenting data from cognitive diagnostic assessment results. Through these activities, there are several problems in learning, including teachers have not been optimal in using technology-based learning media that are inserted with concrete Interactive Edugames; the learning model used by teachers is not optimal in the use of syntax; 73.5% of students experienced low cognitive diagnostic assessment results in science learning; and there are misconceptions in the material on changes in the state of matter such as evaporation and condensation as well as sublimation and crystallization. In addition, several potentials can support the development of learning media by researchers, such as the readiness of students to use cell phones, Wi-Fi, LCD projectors and active speakers in each class. To overcome the problems in science learning, game-based learning media are needed and played directly. Game-based learning media will make learning more enjoyable [17]. So, the researcher will develop an Interactive Edugame learning media based on Quartet Cards in Science with the material of changes in the state of matter.

The second stage is data collection. Data collection is carried out to identify development needs [18]. The data collected by the researcher was obtained through a questionnaire on the needs of teachers and students for media on the material of changes in the state of matter. There are choices of using cognitive levels of questions, using stimuli, delivering material and using learning models that are adjusted to the media needs of students. Based on these data, teachers and students need learning media based on Interactive Edugames and concrete science subjects with material on changes in the state of matter. These media can be adjusted to students' learning styles, including auditory, visual, and kinesthetic [19]. Auditory learning styles can be facilitated with images and text, and visual learning styles are facilitated with learning videos made by researchers, supporting images, and barcodes. Researchers also designed a simple practicum carried out in learning to support students' kinesthetic learning styles. The development of the Quartet Card is made with an attractive appearance and is a game that can be played concretely.

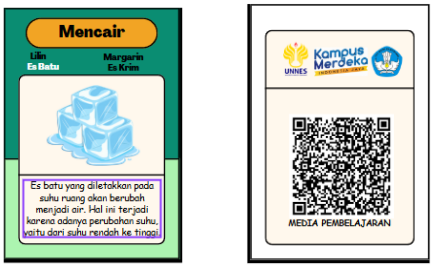
The third stage is data collection. Researchers created a product design for interactive Edugame learning media based on Quartet Card based on teacher and student needs questionnaires [20]. Researchers use the Canva application to design products. There are two types of cards developed by researchers, namely the main card containing images, a brief description of the product and a barcode and a boom card, which is a modified card containing questions that are adjusted to the HOTS cognitive level and presented in text, images, or barcodes. Researchers also created a learning media box and instructions for using the Quartet Card-based Interactive Edugame learning media containing the competencies achieved and instructions for playing. The Quartet Card-based Interactive Edugame learning media developed includes images, text, videos, and barcodes with attractive and easy-to-understand visuals so that it can create enjoyable learning for students [21]. This is supported by (Damayanti, 2021), who stated that the Quartet Card game can stimulate students' enthusiasm for learning [22]. The design of the Interactive Edugame learning media based on Quartet Cards was developed using the Canva application with the Quartet Card box component, instructions for using the Quartet Card containing the competencies achieved the main card with a barcode inserted and a boom card. The results of the design for developing the Interactive Edugame learning media based on Quartet Cards can be seen in Figure 2, Figure 3, Figure 4, and Figure 5.



(a) (b)

Figure 2. Quartet card box design (a), Quartet Card Box (b)

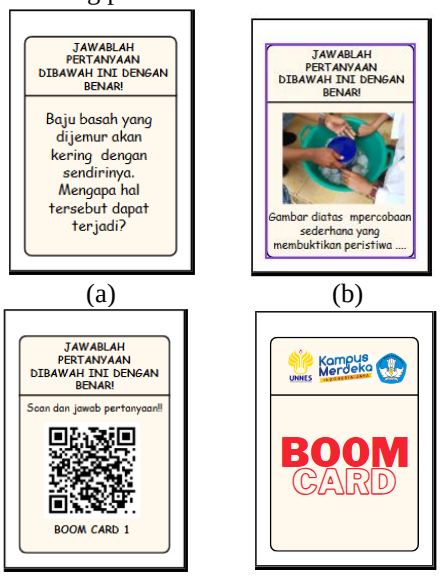
Figure 3. Instructions for using Quartet cards



(a) (b)

Figure 4. Front View (a), Back View (b) Quartet Card Master Card Design

The main card design of the Quartet Card consists of two views, namely the front and back views. On the front of the Quartet Card, there is a material theme at the top, 4 sub-themes of the material in the next section, supporting images, and a brief description at the end containing examples of changes in the state of matter according to the sub-theme section determined in white. On the back are the logos of UNNES, Kampus Merdeka, and Kemendikbud. Below is a barcode containing technology-based learning media used during the learning process.



(a) (b)

(c) (d)

Figure 5. Front View (a), (b), (c), and Back View (d) of Boom Card Design

Boom Card is a card modified by the author in this Quartet Card game. This card contains a punishment when students cannot guess the main card correctly. The beginning of The Boom Card contains questions according to the HOTS cognitive level with operational verbs known as KKO, analyzing, concluding, and comparing 3 types of question variations, namely text, images, and videos presented in barcodes. Instructions for working on the questions are also inserted on the front of the Boom Card. The back of the Boom Card consists of the UNNES, Kampus Merdeka, and Kemendikbud logos at the very top, and the name of the card type is in the next section.

The Quartet Card developed by the researcher differs from the Quartet Card game. The advantage of this Quartet Card is that it is equipped with interactive learning media, which contains a cover, instructions for use, learning instructions, materials, images, videos, audio, and Interactive Edugames as a support for learning that can be accessed using a laptop as an introduction to using the Quartet Card. The development of the Quartet Card carried out by the researcher is equipped with a Quartet Card box, product usage instructions in the form of a brochure leaflet, main card and Boom Card. The specifications of the Quartet Card on each sheet contain images, a brief description of the material, and a barcode on the back. The barcode listed is an interactive learning media compiled by the researcher and can be scanned via a cellphone. This Quartet Card learning media is modified by adding a boom card, a card containing questions in which some questions are developed according to the High Order Thinking Skills (HOTS) cognitive level and can be played concretely. This modification aims to improve students' critical thinking skills [23].

The fourth stage is product validation. The validation stage is carried out to determine the level of validity and analyse the suitability of the material's content with the product being developed [24]. The researcher's validation stages are product validation by media experts and material validation by material experts. After meeting with media and material validators, the researcher obtained values, suggestions, and input on the developed Quartet Card-based Interactive Edugame learning media. In the fifth stage, the researcher carried out product revision actions according to the directions given by the media and material expert validators until the developed product was worthy of testing. This was done so that the product was more in accordance with the specified classification both in terms of material and appearance [25].

The sixth stage is product testing. Researchers conduct product testing. Researchers in small groups of students conduct product testing to obtain an overview, suggestions and improvements to the Interactive Edugame learning media based on Quartet Cards [26]. In a small group trial, the researcher conducted in class IV of SDN Pesantren, Semarang City, with 6 students based on student understanding (complete understanding, partial understanding and less) [27]. Before the trial, the researcher distributed pretest questions; after the trial, the researcher distributed posttest questions to students. The researcher also provided a questionnaire of teacher and student responses to determine whether there were any suggestions and improvements related to the Interactive Edugame learning media based on the Quartet Card before the trial was conducted in large groups.

The seventh stage is product revision. Product revision is carried out to evaluate the feasibility and effectiveness of the product [28]. Product revision is based on the teacher and student response questionnaire results at the product trial stage. This revision can include improvements to content, appearance, or other aspects so that the product is more relevant and supports student learning needs [29]. The teacher and student questionnaire analysis results stated that there were no revisions to the

Quartet Card-based Interactive Edugame learning media because it was in accordance with the existing criteria.

The eighth stage is the usage trial. The usage trial aims to assess the product's effectiveness in a broader context and obtain representative data [30]. This stage was conducted on a large group in class IV of SDN Pesantren Semarang City, totalling 24 students. Before the usage trial was conducted, the researcher distributed pretest and posttest questions after the usage trial. The researcher also provided a questionnaire of teacher and student responses to measure the feasibility of the Quartet Card developed by the researcher.

The ninth stage is product revision. This revision stage is the last revision carried out by researchers before reaching mass production [16]. Product revision at this stage is seen based on teacher and student response questionnaires. The teacher and student response questionnaires distributed by researchers in the trial use (large group) obtained a percentage of 100% with a feasible category, so there were no revisions to the developed product. The tenth stage is mass production. Mass production is carried out to disseminate the developed product widely [16]. This research was carried out until the ninth stage. This is due to the researcher's time and cost limitations.

Feasibility of Quartet Card-based Interactive Edugame Learning Media

The feasibility of Quartet Card-based Interactive Edugame learning media in *IPAS* subjects with material on changes in the form of substances is determined based on the feasibility test results by material expert validators, media experts, and teacher and student responses. Material expert validators are given an assessment instrument consisting of 5 aspects, including 1) accuracy with the learning component; 2) suitability with the level of thinking of students; 3) support for the content of Quartet Card learning media; 4) stimulus helps understand the material; and 5) appropriate support for learning content and media validation instruments with 3 aspects, namely: 1) quality of content and objectives; 2) constructional; and 3) technical/appearance. Technique/appearance. Researchers also distributed teacher and student response questionnaires with aspects of understanding the material, ease of using the media and learning, media presentation, media quality, and instructional quality. The results of the feasibility analysis by media and material expert validators can be seen in Table 1 below.

Table 1. Media and Material Expert Feasibility Assessment Results

Validator	Assessment Percentage (%)	Criteria
Media Expert	90%	Very Feasible
Material Expert	92.5%	Very Feasible

Based on Table 1, the Quartet Card-based Interactive Edugame learning media development product has met the criteria of being very feasible, with a percentage of 90% from media expert validators and 92.5% from material expert validators. The results of the Quartet Card-based Interactive Edugame learning media assessment are also supported by the results of the analysis of teacher and student response questionnaires in Table 2 below.

Table 2. Results of Teacher and Learner Response Questionnaire Analysis

Response	Assessment Percentage (%)	Criteria
Grade IV Teacher	100%	Very Feasible
Students	100%	Very Feasible

Based on Table 2 above, the percentage of teacher response questionnaire results in the usage trial is 100%, with a feasible category. In comparison, the percentage of student response questionnaire results in the usage trial is 100%, which is a very feasible category. Based on the results of the analysis of media and material feasibility tests in Table 1 and the results of the analysis of teacher and student response questionnaires in Table 2, it can be concluded that the Quartet Card-based Interactive Edugame learning media is very feasible to use in *IPAS* learning, especially on the material of changes in the form of substances.

The existence of stimulus variations in the form of images, text, videos, and barcodes is one of the reasons why the Quartet Card-based Interactive Edugame learning media is declared very feasible at 90%. This is evidenced by the score of 25 obtained in the assessment of media experts on technical aspects/appearance. In addition, the various questions in the boom cards adjusted to the HOTS level can improve problem-solving skills in the Problem-Based Learning (PBL) learning model [31]. This is supported by the acquisition of a material expert score of 92.5% with a maximum score of 12 points on the aspect of the suitability of the level of thinking of students. The acquisition of a perfect score of 100% in the teacher and learner response questionnaire regarding media quality and media use indicates that students are enthusiastic about participating in learning. Therefore, the Quartet Card-based Interactive Edugame learning media is very feasible to use in learning science material on changes in the form of substances.

Effectiveness of Quartet Card-based Interactive Edugame Learning Media

The effectiveness of Quartet Card-based Interactive Edugame Learning Media is seen based on the increase in pretest and post-test scores [32]. The pretest value is obtained by asking questions before using Quartet Card-based Interactive Edugame learning media in learning, while the posttest value is obtained by asking questions after using Quartet Card-based Interactive Edugame learning media in learning. The results of the analysis of the pretest and post-test scores can be seen in Table 3 below.

Based on Table 3 above, there was an average increase based on learning outcomes of 37.46 from the pretest score of 51.71 to 88.5 on the post-test score. After determining the average pretest and posttest scores, researchers analyzed the data with the help of the SPSS version 30 application. The initial data analysis conducted by researchers is the normality test, while the final data analysis is the t-test and the N-Gain test.

Table 3. Results of Pretest and Posttest Values for the Usage Trial

Aspects	Pretest Score	Posttest Score
Average	51.71	88.5
Maximum Score	76	100
Minimum Score	24	76

The normality test aims to investigate whether the existing research data is normally distributed or not [33]. In this study, researchers used the help of the SPSS version 30 application using the Shapiro-Wilk formula. The results of the normality test analysis can be seen in table 4 below.

Table 4. Normality Test Results of the Usage Trial

Shapiro-Wilk	Sig. Value	Description
Pretest	.059	Normal
Posttest	.085	Normal

The criteria for the normality test can be seen in the significant value. Data is normally distributed if the Sig value is used. > 0.05 and vice versa if the Sig value. < 0.05, then the data is not normally distributed [34]. Based on Table 4 above, it is known that the Sig value referring to the Shapiro-Wilk pretest data is 0.059, and the posttest data is 0.085. The values of both normality test results are known to be more than 0.05, so it can be concluded that the pretest and posttest data are typically distributed.

After the data is declared normally distributed, the researcher can continue the final data analysis process, namely the t-test and N-Gain. The t-test aims to obtain the difference in students' average learning outcomes based on the results of the pretest and posttest [35]. The t-test conducted by the researcher is the Paired Sample T-Test. The results of the Paired Sample T-test analysis can be seen in Table 5.

Table 5. Paired Sample T-test Result of Usage Test

Paired Sample T-test	Mean	Sig. (2-tailed)
Pretest-Postest	-36.79167	<.001

In the Paired T-test test, it is stated that there is a significant difference in the pretest and post-test results if the Sig value. (2-tailed) <0.05. In table 5, it can be seen that the Sig. (2-tailed) <0.05, namely <.001, there is a significant difference between the pretest and posttest results, with a difference of 36.79167%. Therefore, Quartet Card-based Interactive Edugame learning media effectively improves *IPAS* learning outcomes on material changes in the form of substances.

The last data analysis test is the N-gain test, which is carried out to determine the increase in student learning outcomes before and after using Quartet Card-based Interactive Edugame learning media in class IV *IPAS* learning material changes in the form of substances [36]. The calculation of the N-Gain test uses the help of the SPSS version 30 application. The results of the N-Gain test can be seen in Table 6 below

Table 6. N-Gain Test Results for Use Trial

Action	Average	N-Gain	Citerion
Pretest	54.71	.778	High
Postest	88.5		

Based on Table 6 above, it can be seen that there is an average increase in the use of Quartet Card-based Interactive Eugame learning media in class IV SDN Pesantren Semarang City on the material of changes in the form of substances with N-gain of 0.7780 in the high category. The average increase in student learning outcomes in the trial use of Quartet Card-based Interactive Edugame Teaching Media can be seen in Figure 6 below.

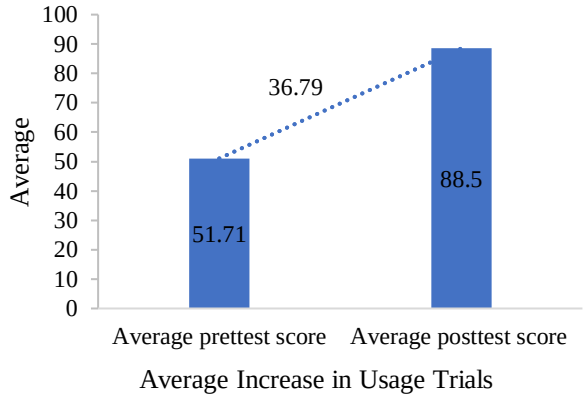


Figure 6. Improved Learning Outcomes of the Usage Trial

The increase in the average pretest and posttest scores in the usage trial (large group) was 36.79. This happened because students were more prepared to participate in learning. The distribution of groups of learners consisting of 7 learners fully understand, 9 learners partially understand, and 8 learners understand less causes the scores obtained to be more diverse due to the different abilities of the learners. In addition, in the learning process, students have been facilitated by using technology such as smartphones/laptops so that there are no obstacles while using Quartet Card-based Interactive Edugame learning media. The Quartet Card learning media developed by researchers is also played concretely to enrich the learning experience, making learning more interesting and fun [37].

The results of the discussion above align with research (Lestari, 2023), which proves that Quartet Card media can improve student learning outcomes and understanding [38]. However, this happens because of the variety of technology-based and concrete learning media that create a pleasant atmosphere to arouse the enthusiasm of students' learning. The use of problem-solving-based learning models (PBL) can be a way to improve students' problem-solving skills in the material of changes in the form of substances [39]. Quartet Card-based Interactive Edugame learning media that is varied with a problem-solving-based learning model is the right integration on the material of changes in the form of substances because it has foreign terms that are rarely heard by students so that it can improve students' understanding of concepts and learning outcomes.

Data analysis conducted by researchers on the Quartet Card-based Interactive Edugame learning media with the results of the N-Gain test showing a high category can be concluded that the Quartet Card-based Interactive Edugame learning media is very feasible and effective to be applied in learning and has been proven to improve the learning outcomes of grade IV students of SDN Pesantren in the subject of Science with the material on changes in the state of matter.

Conclusion

Based on the description of the results and discussion, it can be concluded that (1) the design for developing interactive Edugame learning media based on Quartet Cards was successfully developed with the components of the Quartet Card box, instructions for use containing competencies achieved and how to play, main cards containing images, text, and barcodes and boom cards containing questions in various forms; (2) The feasibility of interactive Edugame learning media based on Quartet Cards from media experts was 90% in the very feasible category and from material experts 92.5% in the very feasible category. Supported by the results of the teacher response questionnaire of 100% and the student response questionnaire of 100%. This happened because the aspects of content quality and purpose, appearance, and use of stimuli presented in the Quartet Card were fulfilled; (3) The effectiveness of the Quartet Card-based Interactive Edugame learning media is seen from the increase in pretest and posttest scores of 36.79% supported by the t-test results of 0.0001 < 0.05, thus obtaining an N-Gain of 0.778 with high criteria. The Quartet Card-based Interactive Edugame Learning Media has been successfully developed, is feasible, and is efficacious in improving the learning outcomes of class IV students at SDN Pesantren Semarang City in the Science learning of the material on changes in the state of matter.

Author's Contributions

Ratna Chandra Purwaningsih: contributed to product development, data analysis, and research writing. Aldina Eka Andriani: contributed to compiling and revising the research.

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