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Improving Science Learning Outcomes Through the Development of the Magic Card Box Learning Media

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ABSTRACT

One problem that often arises in science learning is the low enthusiasm of students to take part in learning, which impacts learning outcomes. The learning method used by the teacher is still reasonably monotonous. The solution is that teachers must innovate and be creative to increase student activity and enthusiasm for learning. One solution is to use learning media that can arouse students' enthusiasm. This study aims to produce science learning media, namely the magic card box for water cycle material, to determine the feasibility of learning media and students' understanding of the water cycle material. This research is development research using a 3-D model. Learning media of the magic card box is validated by material experts, media experts, and learning practitioner assessments. The development instrument is a questionnaire consisting of thirteen indicators distributed to 25 students as respondents. Learning Media The magic card box was tested on fifth-grade students. Validation data and data on the level of understanding of students' cognitive aspects were analyzed quantitatively. Learning media Magic card boxes are produced through the stages of defining, designing, and developing. According to media experts, the learning media feasibility test results obtained a final score of 4.2 with a very good category. Then in the field trial, a score of 4.82 was obtained in the very good category. Students' understanding of the water cycle material based on cognitive aspects obtained an average score of 81.1. Shows that the Magic Card Box Media on the water cycle material is valid, practical and can improve student learning outcomes.

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1. INTRODUCTION

Education is an effort to gain knowledge, either formally through school or informally from education at home and in the community; education is defined as a conscious and systematic effort to achieve a standard of living or for better progress (Wulandari, Mashuri, & Dony, 2018). Education is a process of forming a personality and developing the potential possessed by students (Isnaini, Utami, & Marga, 2018). Education leads a person not only to gain knowledge but also to improve social status, which is helpful for the surrounding community (Hardiansyah, 2022). One factor that determines success in improving the quality of education is the learning process that has been applied (Gammara & Subroto, 2019). The teacher carries out the preparation of the learning process in an effort to achieve the learning objectives that have been determined. One way to realize quality education, or as we expect, is to have qualified and professional teachers (Andriyanto, Sulianto, & Rofian, 2022). Qualified teachers can realize national education goals and have pedagogic, personality, social, and professional competence (Hardiansyah & AR, 2022).

Teachers with pedagogic competence, for example, can design and implement learning and must create fun learning; one way is by using learning media (Nuralisa, Vitasari, & Nestiadi, 2021). Learning media is an intermediary or channelling messages and information from sources that will be received by the recipient of the message that occurs in the learning process (Hardiansyah, 2022). Media use in learning activities is essential to facilitate the learning process to achieve maximum results; the material can be well received when delivered with suitable media (Sintya & Negara, 2020). The use of media in learning must consider students in terms of the needs and readiness of the students themselves, so care is needed in choosing media. In addition to making it easier for teachers to deliver subject matter, the media is also expected to improve student learning outcomes (Twiningsih, 2020). The teacher develops learning media to create a learning atmosphere that stimulates students to be active in their attractiveness and motor skills, one of which is science learning (Meilyana, Heldayani, & Tanzimah, 2022).

Natural science is one of the important subjects taught in elementary schools. Some reasons for the importance of science lessons are that they are helpful for children's lives and work in the future, train them to think critically, and have educational values that can shape their personality as a whole (Serevina, Astra, & Sari, 2018). Science education is expected to be a vehicle for students to learn about themselves and the environment and prospects for further development in applying it in everyday life to adapt to phenomena and changes in the surrounding environment (Duda & Susilo, 2018). In other words, science learning aims to develop students' potential by providing experience by scientifically exploring and understanding the natural surroundings (Pradana, Nur, & Suprapto, 2020). The success of science learning is determined by various things, including students' ability and teachers' ability to carry out a meaningful teaching and learning process in accordance with the objectives of teaching science in the curriculum (Juniar, Silalahi, & Suyanti, 2018). Problems that have occurred so far for students include where students cannot understand the material or concepts that exist in science lessons and students cannot save or record/remember lessons for a long time (the classes received immediately forget) (Hardiansyah & Mas'odi, 2022). This happens because of several problems that occur during the learning process, namely that: (1) teachers are less creative / lack variety in learning; (2) the learning media used by the teacher is less varied in the learning process so that learning does not attract students' enthusiasm to participate in the learning process actively; (3) the learning atmosphere in the classroom is boring.

Based on a pre-survey conducted twice in one of the elementary schools in the city of Sumenep, the first is the results of class observations that the class atmosphere is not conducive, students chat with their classmates and even walk around during the learning process, the teacher explains the lesson by lecturing and giving assignments. Students' enthusiasm is low in learning, while in the Psychomotor aspect, students are less interested in participating in science in class, so when students'

performance is less than optimal. Second, the results of interviews with science subject teachers consider that students are challenging to manage; as many as 18 students get scores below the minimum completeness, and 14 students have achieved scores above the minimum fullness in odd semester exams, science subject teachers still use the traditional method, but the teacher realizes the importance of using more innovative methods or more mixed media. The survey results found problems in the science learning process, thus affecting learning outcomes. From the cognitive aspect, it can be seen that the learning outcomes of science subjects are still low; this is evidenced by the results of the odd semester exams, where some students have not reached the minimum standard of completeness criteria. The minimum score for science completeness criteria is 62, but as many as 18 students (56.25%) have not yet completed learning outcomes out of 32 students. From the affective aspect, it is said that students are still passive in responding to the material presented by the teacher. Then in the psychomotor element, students are less interested in the learning process, causing students to be less than optimal in performance.

Problems related to low learning outcomes must be addressed immediately, so there is a need for solutions so that students become more active and the focus of the learning process (student centre). Creative teachers are good at making decisions, dominating the class, and designing a teaching style involving students in decision-making to make students active, varied and creative in the learning process (F. P. Sari, Ratnaningtyas, Wilujeng, & Kuswanto, 2019). One way is to use learning media to create a fun and participatory atmosphere during the learning process to improve learning outcomes.

Previous research was conducted by (Sholiha, Tamam, & Munawaroh, 2017) with the title Development of Light Box Media in the 5th-grade elementary school science lesson on the nature of light material. The results showed that the percentage of the feasibility of lightbox learning media according to material experts and linguists was 99.4% (very feasible), material experts 90% (very feasible), and media experts 86.9% (very feasible). The effectiveness of the lightbox learning media is measured in terms of the process that can be obtained from the learning outcomes test (very effective). Furthermore, research conducted by (Rusiana, 2014) with the title Using Kokami Media in Science Subjects to Improve Student Learning Outcomes in Class VA SDN Darungan 01 Tanggul District, Jember Regency. The research was conducted in two cycles showing that student learning outcomes can be adequately improved. This is evidenced by the data that the percentage of students' completeness in working on the questions increased from 57.89% to 92.10% after using the mysterious card box in learning.

Teachers usually use learning media to convey learning so that the material delivered is readily accepted by students and that learning is more meaningful. One media that can be used is the magic card box (Indah, 2021). Magic card box media is an educational game capable of stimulating students' innovative, creative, and critical thinking (Muslikhah, 2019). This magic card box media aims to attract students' interest in participating in learning and imparting knowledge to students. Through this media, students can play and learn about the material being taught so that the lesson will make an impression on students' minds (N. V. Sari, 2021). To learn to use this media, the teacher only needs to prepare a container (box) in which envelopes will be filled. Inside the envelope were message cards with various colours containing questions, commands, and pictures of understanding of the subject matter being studied. Positive responses that arise communicatively result from games designed excitingly and systematically (Sandy & Yermiandhoko, 2018). The magic card box is very suitable to be applied to elementary school students who are at the age of children or playing age and are expected to improve the learning outcomes of science subjects for students.

2. METHODS

This research design uses Research And Development (R&D). Research & Development is a research method used to produce a particular product and test its effectiveness of the product. The

development procedure in this study uses a 3-D model consisting of the Definition Stage (Define), the Planning Stage (Design), and the Development Stage (Develop).

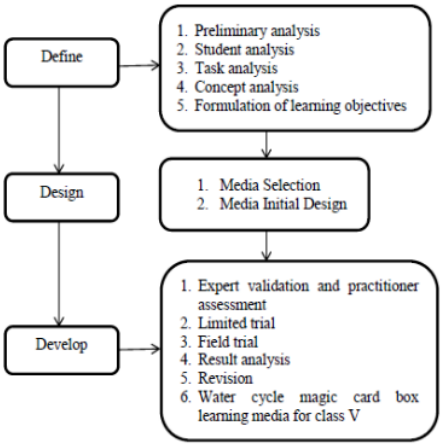

Figure 1. Development Style

Based on figure 1, in the define stage, researchers carry out activities to find problems and weaknesses in developing a product and collect data and realities as much as possible on various problems and efforts to solve them. At the design stage, the researcher selects media according to the material and characteristics of students and then makes designs and concepts of learning media that will be developed. The preparation of the water cycle magic card box media design consists of; (a) The background of the magic card box that develops the occurrence of the water cycle process. (b) The flow of the water cycle starts namely evaporation, until the occurrence of rain. At the development stage, it is carried out to produce development products through two steps: (1) Expert Appraisal followed by a revision, then (2) Developmental Testing. The goal at the development stage is to produce the final form of the magic card box media after revisions based on input and suggestions from experts and test data. In this study, the product developed or produced must be validated by at least one media expert, material expert, and practitioner (teacher). Field trials were conducted on 25 students. To know the student's assessment of the developed media products and the behaviour of students' understanding from the cognitive aspect. The data collection technique in this study used (1) a questionnaire; the answer choices were using a Likert scale of 5. The Likert scale measures perceptions, attitudes and opinions of a person or group of social phenomena or events. (2) test. The questionnaire indicators (see table 1).

Table 1. Questionnaire Indicator

No	Question
1	I think this medium is suitable for learning about the water cycle
2	This media helps me in understanding the material of the water cycle
3	This media motivates me to learn
4	I enjoy learning to use this medium
5	I think this medium is easy to use
6	I think the media is suitable for use in class V
7	I think the illustrations presented are in accordance with reality
8	I think the presentation of objects in this media is interesting

9	I think this media is durable and not easily damaged
10	I think the media size of the water cycle magic card box is appropriate
11	I think the color composition used is appropriate
12	I think the use of media has involved students
13	There is a manual

The data analysis technique in this study used quantitative descriptive analysis by finding the average.

$$x = \frac{\sum x}{N}$$

Figure 2. Average Formula

It is carried out in post-test activities to assess students' understanding of the water cycle material.

Table 2. Quantitative Data Conversion

Score	Formula	Calculation	Criteria
5	X > Xi + 1,8 Sbi	X > 4,08	Very Good
4	Xi + 0,6 Sbi < X ≤ Xi + 1,8 Sbi	3,36 < X ≤ 4,08	Good
3	Xi - 0,6 Sbi < X ≤ Xi + 0,6 Sbi	2,64 < X ≤ 3,36	Enough
2	Xi – 1,8 Sbi < X ≤ Xi – 0,6 Sbi	1,92 < X ≤ 2,64	Not good
1	X ≤ Xi - 1,8 Sbi	X ≤ 1,92	Very not good

3. FINDINGS AND DISCUSSION

3.1 Defining

In this activity, data was obtained from the SDIT AL Hidayah, namely the 2013 curriculum, which will be used as a guide in media development. Based on the applicable curriculum, competency standards and essential competencies are obtained, which are used as guidelines for media development (see Table 3).

Table 3. Competency Standards And Basic Competencies

Competency Standards	Basic Competencies
7. understand the changes that occur in nature and their relationship to the use of natural resources	7.4 describe the processes of the water cycle and human activities that can affect it

Furthermore, the tasks that students must fulfil are, working on student worksheets, conducting demonstrations, observing the water cycle, presenting the results of group discussions, and other activities.

3.2 Designing

The media selection stage is carried out according to the material and characteristics of the students. Then collect the tools and materials used in the manufacture of media, among others; The tools and materials used are saws, hammers, burs, rulers, wooden latch boards/plywood with a thickness of 1-2 cm, plywood boards 0.5 cm, chopsticks, nails, paper, markers, chopsticks, zinc/aluminium, rubber bands, wood glue. After all, the tools and materials are collected, start making the mysterious card box media as follows; make a three-dimensional box in the form of a block or cube measuring 20 cm x 15 cm x 15 cm (according to needs), and the box is made of wood. This box consists of two bottom and top holes measuring 10 cm x 1.5 cm (adjusted to the size of the tool hole). The top and bottom holes are adjusted to the tool's height. A door shaped like a cupboard is at the back of the box. At the bottom, there is a cardholder / for storing cards. Provide

boards/plywood with a thickness of 1.5 to 2 cm, then make 4 squares/rectangles with each size; (a) front board measuring 20 cm x 15 cm, (b) 2 sideboards measuring 20 cm x 15 cm, (c) backboard measuring 20 cm x 15 cm, (d) 2 top and bottom boards measuring 15 cm x 15 cm. then add another gutter board measuring 16 cm x 13 cm x 0.5 cm.

The primary tool in a semi-cylindrical box used for the passage of cards attaches to one side of the front box right at the hole on the top and bottom of the box. This tool is made of a slippery material made of zinc or aluminium. Cut into rectangles, each measuring 28 cm x 12 cm, 17 cm x 12 cm, two semi-circles, each with a diameter of 7 cm (the bottom is slightly sharp), 5 cm (the bottom is slightly sharp). Zinc/aluminium are linked to each other, starting from a square with a semi-circle. After the two are connected, the hole is made 1 cm. The tool's card controller lever is hooked up in the right or left side box. The lever is cylindrical and made of bamboo (chopsticks) / 5 mm iron. A controller can be given in the middle, which can be made of zinc or thin material. The lever is nailed, and the rubber is attached to the box. This tool is given a small nail for a rubber hook or spiral.

Trays that can be pulled and pushed are located under the bottom hole and the tool hole section. After the box, tools, control lever, and gutter are finished, the next step is for the primary tool to be mounted on the inner front side box. The top central tool hole is positioned right at the top box hole; the central bottom hole is right at the bottom box above the gutter hole. Before installing the tool, the bottom of the tool is clamped using bolts/nuts. Make sure the controller fits right in the tool hole on the back as a controller, so the card does not pop out right away. Question cards are made of thick paper with a minimum size of 100 gsm or use colourful buffalo paper. Square or rectangular, with a size of 8 cm x 8 cm (the width and length of the card are smaller than the tool hole).

3.3 Developing

This stage includes media expert validation, material expert validation, and practitioner assessment. Media specialists directly evaluate the product (water cycle mysterious actuator media box and User Manual) based on pre-defined criteria and suggestions for improvement.

Table 4. Media Expert Assessment Phase I

No	Indicator	Score				
		1	**2**	**3**	**4**	**5**
	Amount		3	6	9	2
	Amount x Score		6	18	36	10
	total number			70		
	Average			3.5		

Table 5. Media Expert Assessment Phase II

No	Indicator	Score				
		1	**2**	**3**	**4**	**5**
	Amount				16	4
	Amount x Score				64	20
	total number			84		
	Average			4.2		

The results of the first stage of the media expert assessment (see table 4) obtained a score of 70 with an average of 3.5. Based on the quantitative data conversion guidelines, the water cycle mysterious card box media is in good criterion. The results of the second stage of the media expert assessment (see table 5) obtained a score of 84 with an average of 4.2. Based on the quantitative data conversion guidelines, the water cycle mysterious card box media is included in the Very Good

criteria. The overall media expert validation was carried out in two stages. Experts have assessed each stage with different average scores.

Table 6. Material Expert Assessment Phase I

No	Indicator	Score				
		1	2	3	4	5
	Amount				13	2
	Amount x Score				52	10
	total number			62		
	Average			4.13		

Table 7. Material Expert Assessment Phase II

No	Indicator	Score				
		1	2	3	4	5
	Amount				6	9
	Amount x Score				24	45
	total number			69		
	Average			4.6		

The results of the first stage of the assessment (see table 6) obtained a score of 62 with an average of 4.13. Based on the quantitative data conversion guidelines, the product developed is included in the Very Good criteria. The results of the second stage of the assessment (see table 7) obtained a score of 69 with an average of 4.6 with very good criteria according to the quantitative data conversion guidelines. Valuation by material experts is carried out in two stages. Each stage gets a different score from the material expert.

Table 8. Practitioner Assessment Results in Phase I

No	Indicator	Score				
		1	2	3	4	5
	Amount			4	21	5
	Amount x Score			12	84	25
	total number			121		
	Average			4.03		

Table 9. Practitioner Assessment Results Phase II

No	Indicator	Score				
		1	2	3	4	5
	Amount				20	10
	Amount x Score				80	50
	total number			130		
	Average			4.33		

The assessment results of phase I learning practitioners (see table 8) obtained a score of 121 with an average of 4.03 with good criteria according to the quantitative data conversion guidelines. However, some things need to be improved, considering that not all components can be achieved optimally. The assessment results of stage II learning practitioners (see table 9) obtained a score of 130 with an average of 4.33. Based on the guidelines for converting quantitative data, the product developed falls within the very good criteria.

At the field trial stage, the number of respondents was 25 students of SDIT Al Hidayah; respondents were asked to view or watch videos of the water cycle process, which can be accessed on

Youtube. Then respondents were asked to read the water cycle mysterious card box manual, after which respondents were given a questionnaire in the form of a questionnaire provided by the researcher through Google form to provide an assessment of the water cycle mysterious card box media product developed.

Table 10. Field Trial Results

Amount	Average	Criteria
1566	4.82	Very Good

Table 10 shows that the total score achieved is 1566 from each indicator answered by respondents as many as 13, with an average of 4.82 from the results of the total number of indicators answered by the respondents for many respondents who answered. Based on the quantitative data conversion guidelines, the mysterious card box learning media product developed is in the very good category.

The development of the water cycle mysterious card box learning media in the fifth-grade science subject at SDIT Al Hidayah is based on the problems determined by the researcher, namely the limitations and lack of availability of learning media and practical tools. One of the materials taught using media or practical activities is the water cycle material. The learning media used by the teacher to convey water cycle material readily accepted by students so that learning is more meaningful is the mysterious card box media. The mysterious card box media developed will help students understand the water cycle process. The mysterious card box media is one of the media that combines educational games. A small box used to learn (acquire knowledge) is considered a new or strange item in which humans move some tools—reinforced by (Prastikawati, Rofiqah, & Widayanti, 2020), which states that the mysterious card box is a game with media being an alternative that functions to stimulate learning activities to be more active and able to attract students' attention from boredom. So that students are interested and understand the process of the water cycle, such as illustrations of the ocean, land and how the rain occurs.

From the observations that researchers have made during the learning process, the use of the mysterious card box learning media makes it easier for students to understand the material and have no difficulty in answering questions on the question cards by the media function proposed by (erfi) the media function in learning activities, namely generating learning motivation, providing learning stimuli and activating student responses. In some instances, the media also serves to help students to be more active and learn to be varied so that it is not dull (Muslikhah, 2019). During the observations made by the researchers at meetings 1, 2, and 3, students looked enthusiastic about playing the mysterious card box learning media game; it was seen from the results of observations about student interest which was shown by students' interest in science eyes marked by students asking questions related to science material being studied. Learning media needs to be developed using a 4-D model to produce the mysterious card box and reinforced by (Winarni, Naimah, & Widiyawati, 2019), who stated that the 4-D development design consists of four main stages: defining, designing, developing, and disseminating. However, the development of the mysterious card box learning media was only carried out until the third stage, namely define, design, and develop, because of the limitations of researchers to carry out the fourth stage.

The defining stage is divided into four stages: early-late analysis, student analysis, concept analysis, and goal formulation. In the initial and final analysis stage, the researcher conducted observations and interviews with the principal, teachers, and fifth-grade students. Based on observations and interviews with the principal, teachers, and several students, several problems were identified in learning science in grade V. Almost all science materials in grade 5 were taught by rote, one of which is the water cycle material due to limited media and practical tools for teaching and learning activities about the water cycle material. In addition, the water cycle learning media is still

limited because it only uses student books after the preliminary analysis and then the student analysis. The student analysis activity found that the fifth-grade students had different abilities, seen from the level of knowledge, skills, and attitudes. Then proceed with concept analysis; this activity obtained data from the curriculum used in SDIT Al-Hidayah, namely the 2013 curriculum. The basic competence is 7.4, describing the water cycle process and human activities that can affect it. After the concept analysis was carried out, it was continued with task analysis, namely in the form of tasks that must be fulfilled by students, such as working on student worksheets or evaluation questions. Furthermore, at this stage, the study of objectives is carried out to determine the indicators and learning objectives to be achieved in the water cycle material. The goal is that students can mention the use of water and explain the process of the water cycle correctly.

At the planning stage (design) carried out several activities, namely the media selection and initial setup of the media. The media chosen is a mysterious card box learning media that can describe the water cycle process. Then in this activity, collect tools and materials that will be used to make mysterious card box learning media. These materials include styrofoam, glass for making aquariums, paint, glue, plastic, light bulbs, sponges, LED lights, switches, water pumps, plants, and magnets. At the same time, the tools used include scissors, needles, double-sided tape, pliers, saws, cutters, brushes, tape measure, and tools for burning glue. After the tools and materials are collected, the mysterious card box learning media is made. At the development stage, validation is carried out by media experts and material experts; then, learning practitioners and student responses assess limited trials and field trials.

Based on the validation carried out by media experts, a final score of 4.2 was obtained in the very good category. From the assessment carried out by media experts, it can be said that the mysterious card box learning media is worthy of use and trial. Based on the validation carried out by material experts, a final score of 4.6 was obtained in the very good category; then validation was also carried out on learning practitioners, who got a final score of 4.33 in the very good class. After receiving an assessment by a learning practitioner, a limited trial was conducted. The little test results were obtained with a score of 3.84 in the Good category. The final stage was field trials with a score of 4.34, a very good class. The learning objectives are the development of the mysterious card box learning media. This is supported by student questionnaires on points 1, 3, and 15, with an average acquisition of 4.47 and the second point with purchase of 4.53. Understanding the water cycle material can be seen from the cognitive aspect as a guide for learning activities to assessment. Understanding the cognitive development of elementary-age students in the educational process will be maximized if the teaching materials conveyed can be understood by students (Sandy & Yermiandhoko, 2018). To determine students' understanding of the water cycle material that has been taught, an evaluation question is given at the end of the lesson. Based on statistical data, the average score related to understanding the water cycle material is 81.1. The average has met the graduation standard

4. CONCLUSION

Based on the assessment of media experts, the water cycle mysterious card box media is included in the very good category (4.2). Based on the assessment of material experts, the water cycle mysterious card box media is included in the very good category (4.6). Based on the assessment of learning practitioners, the water cycle mysterious card box media is included in the very good category (4.33). Based on the results of field trials, the water cycle mysterious card box media is included in the very good category (4.82). Based on this assessment, it can be concluded that the water cycle mysterious card box learning media is suitable for teaching water cycle material in the fifth-grade science subject at SDIT Al Hidayah. Students' understanding of the water cycle material is seen from the cognitive aspect by obtaining an average of 81.1. Overall, fifth-grade students at SDIT Al Hidayah have achieved complete learning.

The limitation of this study is that the level of students' understanding is not yet known whether it is purely the result of using manuals and watching videos explaining the water cycle process or not because the pretest has not been carried out. Researchers found it difficult to explain the rules for using the mysterious card box learning media at the beginning of the lesson, even though the next meeting went well. Students' level of understanding is different, so researchers must be more optimal in carrying out learning; the implementation of research is only focused on the water cycle material, so it cannot be generalized to other science materials. Researchers should be able to manage study time and lesson plans more effectively and can apply media to other materials

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