

DEVELOPMENT OF CARD-ASSISTED PATTAYA (SOLAR SYSTEM PUZZLE) LEARNING MEDIA AT SIXT GRADES SDN 30 CAKRANEGARA IN SCIENCE LEARNING

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Article Info

Article history:

Received: 21-05-2023

Revised: 25-05-2023

Published: 31-01-2024

Keywords:

Instructional Media;

Puzzles;

Solar system;

Card;

Science Learning

ABSTRACT

Development of card assisted PATAYA (Solar System Puzzle) learning media as an effort to provide innovation in science learning on solar system material. Innovations were made to overcome problems in science learning such as students being less active, teacher-centered learning, less varied use of media, and teachers having difficulty visualizing science material. The research aims to explain the design, determine the validity and practicality of the card assisted PATAYA (Solar System Puzzle) learning media in Sixt grades science learning at SDN 30 Cakranegara. The method used is Research and Development with a model developed by Sugiyono. The research results show that the development design using the Sugiyono model went through 9 stages, namely the potential & problem stage, data collection, product design, design validation, design revision, product testing, product revision, usage testing, and product revision. The results of the media validity test are in the very valid category based on the assessment of media experts at 98.75% and material experts at 86%. The level of practicality of the media is in the very practical category based on the teacher's response assessment at the two testing stages of 100%, while the student response assessment at the product trial was 96.59% and the usage trial stage was 97.63%. Through these results it can be concluded that the card assisted PATAYA (Solar System Puzzle) learning media can be used in Sixt grades science learning at SDN 30 Cakranegara. This research has implications for the science learning process which makes it easier for teachers to explain the solar system material to students and can foster student activity.

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1. INTRODUCTION

21st-century learning requires teachers to carry out student-centered learning and refers to the 4C competencies: creative, critical thinking and problem solving, collaboration, and communication. This requires teachers to prepare for learning well by developing creative ideas. In line with what (Ramdani et al., 2019) Ramdani et al., (2019) said, 21st-century learning that is oriented towards 4C competencies must be carefully prepared by teachers so that students can master these competencies and can play an active role in learning. At the elementary school level, so that students can play an active role, a teacher must be able to apply this learning to all subjects, including Natural Sciences (Science). Science learning aims to develop and foster a scientific attitude through understanding science concepts (Sugiarti et al., 2020). Understanding of this concept can be developed through media in the learning process. The media must be able to concretize science material to make students more active and creative. This is in line with what Suryanda et al., (2020) said, that the use of appropriate and appropriate science learning media will be able to stimulate student activity in learning.

However, based on interviews with Sisxt grades teachers at SDN 30 Cakranegara, researchers found that student participation in science learning still needed to be improved. Students prefer lessons related to visuals and movement, such as drawing and sports lessons. The class teacher said that Sisxt grades students had almost the same characteristics, such as liking to play in class, busy talking during learning and preferring to do things in groups. In the learning process in class, it was discovered that students preferred learning with interesting pictures, so the teacher said that most of the Sisxt grades students had a visual learning style. At the same time, 2 or 3 people had a kinesthetic learning style.

During the interview activities, the teacher felt he still had difficulties applying appropriate media in the learning process. This causes the learning created in the classroom to be still teacher centered. Teachers are also less varied in choosing the learning media used in class because the media used is limited to images, video shows, and power points. Apart from that, students also lack discipline if asked by the teacher to bring some equipment and materials to carry out practices such as making electrical circuits.

Based on this, an innovation is needed involving media to make it easier for teachers and students in the learning process. Wahyu et al., (2020) revealed that the use of media in science learning must be carried out because science material contains abstract concepts and principles, so it requires media that is able to make them concrete. One of the science materials that requires media to provide visualization and concreteness is the solar system. The solar system is one of the materials contained in science learning. In the solar system material, students are asked to be able to explain the solar system and the characteristics of the members of the solar system as well as create a simple model of the solar system in accordance with KD 3.7 and 4.7. As is known in solar system materials, there are distance and space barriers in delivering the material. Therefore, media is needed in the delivery process.

Seeing the importance of using learning media, the characteristics of solar system material, and the learning styles of Sisxt grades students, namely visual & kinesthetic, it is necessary to develop a media that is more interactive and interesting. One learning media that can be developed is puzzle learning media in collaboration with card media. Narulita et al., (2021) and Utami et al., (2021) revealed that puzzle and card learning media have advantages such as attracting students' attention so that students become more active, train their concentration, and can eliminate obstacles in learning. Through this game, it is hoped that the use of card-assisted puzzle media will be able to create student activity in participating in the ongoing learning process.

A similar thing was also studied by Nila & Nurjanah (2021) in a study which obtained the results that the puzzle media developed was valid and suitable for use as a science learning media for class V students at SD Negeri 1 Mendo Barat. In this research, through the media of puzzles and cards, students can foster creativity and activeness. However, the media developed in this research does not contain any follow-up in the use of media that can directly demonstrate students' understanding of the material, such as questions or missions that must be completed by high class students.

Based on this phenomenon, researchers want to develop puzzle learning media on solar system material with the help of cards for Sisxt grades students. The puzzle media will be equipped with questions related to the material behind the puzzle pieces. This card assisted PATAYA media will be validated by material and media experts to determine the validity of the media design developed before the media can be tested on Sisxt grades students and teachers at SDN 30 Cakranegara. Through this media, it is hoped that students will be able to know, remember and explain the characteristics of each planet in the solar system well. Therefore, researchers are interested in conducting this research with the title "Development of Card-Assisted PATAYA (Solar System Puzzle) Learning Media in Sisxt grades Science Learning at SDN 30 Cakranegara.

2. METHOD

The research method used is research and development (Research & Development). This research uses a model Sugiyono (2013) developed, which has ten stages. However, this research only went through 9 stages due to time and cost limitations, and this research only measured the level of practicality of the product produced. The nine stages are potential and problems, data collection, product design, design validation, design revision, product testing, product revision, usage testing, and product revision. The research was conducted at SDN 30 Cakranegara in the even semester of the 2022/2023 academic year, with the research subjects being teachers and Grade 6 students.

The data collection techniques used were interviews to determine the potential and problems that exist in the school, questionnaires to determine the level of validity of the media developed through validity testing by expert validators (media experts and material experts), and determine the level of practicality of the media developed through user responses (teachers and students), as well as documentation in the form of photos of research implementation so that it is more reliable. This research used instruments in the form of interview guides and questionnaire sheets. The preparation of the scale questionnaire uses a Likert scale with a score range of 1-5 so that the assessment is number 5 for very good information, number 4 for good information, and number 3 for fairly good information. In contrast, number 2 is for poor information, and number 1 is for

information. very poor (Sudaryono, 2016). Media expert validators and material experts carried out the questionnaire assessment to determine the validity of the media and student and teacher user responses to determine the media's practicality level.

The assessment is carried out by marking a checklist in the column provided. The assignment of checklist symbols is adjusted to the responses to the statements in the questionnaire. Interviews were conducted before creating card-assisted puzzle learning media based on problems occurring at school. Interviews were conducted to determine the initial conditions of SDN 30 Cakranegara.

The data obtained was analyzed through quantitative descriptive analysis from the results of expert validator questionnaire assessment scores and results from user responses (students and teachers) and qualitative descriptive analysis from criticism and suggestions provided by media expert validators and material experts. Assessment of data resulting from the validation process of media experts and material experts, as well as student and teacher responses, can determine the criteria for the validity and practicality of learning media through the conversion of the assessment level scale as follows:

Table 1. Criteria for achieving the card assisted PATAYA (Solar System Puzzle) media validity test

Achievement Level	Category
81%-100%	Very Valid
61%-80%	Valid
41%-60%	Fairly Valid
21%-40%	Less Valid
0%-20%	Invalid

Table 2. Criteria for achieving the card assisted PATAYA (Solar System Puzzle) media practicality test

Achievement Level	Category
81%-100%	Very Valid
61%-80%	Valid
41%-60%	Fairly Valid
21%-40%	Less Valid
0%-20%	Invalid

3. RESULT & DISCUSSION

3.1. Card-assisted PATAYA (Solar System Puzzle) Learning Media Development Plan

This research produces a product in the form of card-assisted PATAYA (Solar et al.) learning media for science learning. The researcher designed the development of this media using a development model developed by Sugiyono, which consists of 10 stages, namely: 1) Potential and problems, 2) Data collection, 3) Product design, 4) Design validation, 5) Design revision, 6) Product testing, 7) Product revision, 8) Usage trials, 9) Product revision, 10) Mass production. The research and development results carried out by researchers only went through 9 stages due to time and cost limitations and only measured the product's practicality. The nine stages are as follows:

1. Potential & Problems

At this stage, interviews were conducted with Sisxt grades teachers to discover the potential problems at SDN 30 Cakranegara. Through interview activities, the results obtained were that the existing potential was that students had an interest in visual and kinesthetic learning. Apart from that, students are interested in learning carried out in groups.

The problem found from the Sisxt grades teacher interviews was that student participation in science learning still needed to be higher. This is characterized by students who need to be more active in learning and prefer drawing lessons and sports. Apart from that, teachers still have difficulty implementing appropriate media, so learning is still teacher centered. Given these potentials and problems, researchers developed card assisted PATAYA (Solar et al.) learning media which can be used as a science learning media for Grade 6 students.

2. Data Collection

The data collection stage began with a literature study regarding the importance of card-assisted puzzle learning media as an intermediary in conveying material so that the media developed can be maximized.

Apart from that, materials were collected to support the development of card assisted PATAYA (Solar System Puzzle) media at the product design stage, such as determining the KD and indicators used, namely KD 3.7 & 4.7, collecting material and images regarding the characteristics of the solar system such as planets, the sun, comets, asteroids, and meteors.

3. Product Design

Researchers created a design using the Coreldraw X7 application as a design in developing a product in the form of card assisted PATAYA (Solar System Puzzle) learning media. The product design of the card assisted PATAYA (Solar System Puzzle) learning media is as follows.

a) Solar System Puzzle

There are 8 PATAYA (Solar et al.) boards made from wood measuring 30cm × 30cm. The dominant puzzle board background is dark blue with small white stars. On the left side of the puzzle board, there are animated images of planets, the sun, orbital paths, planet names, and characteristics of the planet. On the right side of the puzzle board is an animated image of an astronaut, fun fact planet writing, and a box where the fun fact planet cards are stored. At the bottom of the puzzle board is a logo and the researcher's name. The type of font used is Aeronaves Personal Use Only, with a font size of 58 for the planet names. The planetary characteristics are written using the Impact font with a font size of 14. The design of the solar system puzzle board can be seen in the following image.

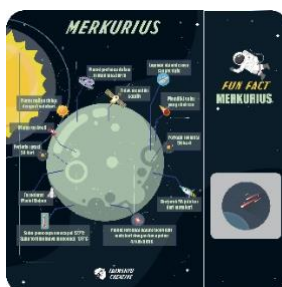


Figure 1. Solar system puzzle design

b) Planetary Material Questions

On the back of the puzzle pieces there are 9 questions regarding the characteristics of each planet. The background on the question is gray. The questions are made to resemble stickers using art paper which is attached to the back of the puzzle pieces. The type of question being created is an essay. The font used is Impact with size 14 in black. The design of the planet questions behind the puzzle pieces can be seen in the following image.



Figure 2. Design the questions behind the solar system puzzle pieces

c) Fun Fact Card

There are 9 fun fact cards as a complement to the card assisted PATAYA media. The card is made from art paper with a size of 10cm × 6.5cm. The background of the card is the same as the puzzle board, namely dark blue with small white stars. On the front of the card there is the researcher's logo and name, an animated image of the planet, a description of the planet's name in English and Indonesian, accompanied by images of the English and Indonesian flags. On the back of the card there is brief information about the characteristics of each planet. The type of font used to write planet names is Aeronaves Personal Use Only with a font size of 14 in yellow. The brief information about the planets written on the back uses the Futura Md BT font with a size

of 9 in black. The fun fact card design in PATAYA (Solar System Puzzle) media with the help of cards can be seen in the following image.

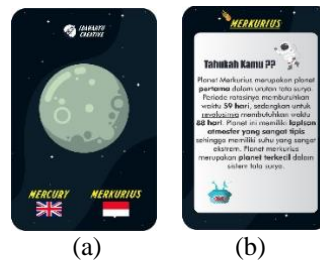


Figure 3. Fun fact card design
(a) Front part (b) Back part

d) Instructions for use sheet

An instruction sheet measuring 25cm × 15cm is printed and then laminated. The background of the instruction sheet is dominated by dark blue with space animations such as meteors, asteroids, stars, rockets, and astronauts. The type of font used is white Marykate with size 18 for the title section and size 15 for the contents of the instructions. The design of the instruction sheet for using PATAYA (Solar System Puzzle) media with the help of cards can be seen in the following image.



Figure 4. Design a sheet of instructions for using PATAYA (Solar System Puzzle) media with the help of cards

e) Carry On Suitcase

There is a carry-on suitcase for storing card-assisted PATAYA media, where on the front and back there is a sticker depicting PATAYA media with a size of 50cm × 35cm. The background on the front and back of the suitcase is dominated by dark blue with space animations such as stars, rockets, astronauts, asteroids and planets. At the top there is a logo and name of the researcher, there is a description of the learning media, in the middle there is a description of the name of the media. On the left side there is a description of the class targets for media use. At the bottom there is an image or form of card-assisted PATAYA media. The sticker design on the card-assisted PATAYA (Solar System Puzzle) media carry-on luggage bag can be seen in the following image.

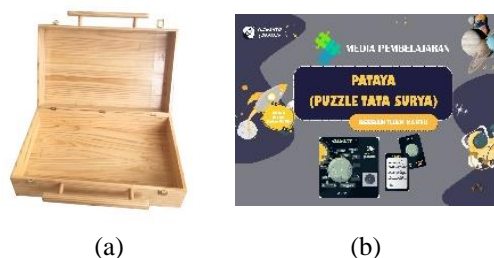


Figure 5. Card-assisted PATAYA (Solar System Puzzle) media tote bag design
(a) Carry-on luggage bag (b) Sticker design on the front and back of the bag

4. Design Validation

Design validation was carried out through a validity test to determine the level of validity of the card assisted PATAYA media design. Validation is carried out by filling out a questionnaire on a scale of 1-5. Design validation was carried out by media experts, namely Mr. Muhammad Tahir, S. Pd., M. Sn and material experts, namely Mr. Muhammad Syazali, M. Pd. Media expert validation was carried out 2 times, namely the

first stage (before revision) on February 23, 2023, and the second stage (after revision) on March 17, 2023. Meanwhile, material expert validation was carried out 2 times, namely the first stage (before revision) on 6 March 2023 and the second stage (after revision) on March 13, 2023.

5. Design Revision

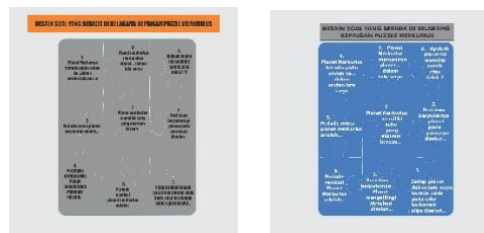
After identifying the weaknesses in the previous product design, improvements or revisions are then made based on suggestions and notes provided by media and material expert validators. In media validation, the suggestions given are to change the background according to its original condition and change the text size to be larger. Meanwhile, in material validation, the suggestion given was to replace the animated image of the planet with an image of a real photo of the planet.



(a) (b)

Figure 6. Solar system puzzle before

(a) Puzzle design before revision (b) Puzzle design after revision



(a) (b)

Figure 7. Design planetary material questions

(a) Design of questions before revision (b) Design of questions after revision



(a) (b)

Figure 8. Fun fact card design

(a) Fun fact card design before revision (b) Fun fact card design after revision



(a) (b)

Figure 9. Tote bag sticker design

(a) Tote bag sticker design before revision (b) Tote bag sticker design after revision

The material validation also provides additional suggestions, namely adding a solar system puzzle containing the sun and its members so that all basic competencies can be fulfilled.



Figure 10. Additional puzzles after revision

6. Product Testing

Card-assisted PATAYA media was tested with a small-scale group involving 1 teacher and 16 Sixth grades students at SDN 30 Cakranegara. Trials were carried out to determine the level of practicality of the media by filling out a questionnaire on a scale of 1-5. This small-scale product trial was carried out on March 22, 2023.

7. Revision Product

The card assisted PATAYA media was not revised, because at the previous product testing stage there were no criticisms or suggestions for the media.

8. Usage Trial

The card assisted PATAYA media was then tested with a large-scale group involving 1 teacher and 30 Sixth grades students at SDN 30 Cakranegara. Trials were carried out to determine the level of practicality of the media by filling out a questionnaire on a scale of 1-5. This large-scale usage trial was carried out on March 23, 2023.

9. Revision Product

At this stage no revisions are carried out because at the previous stage there were no suggestions and criticisms given by teachers and students so that the media developed is very practical to use without revision.

3.2. Validity of Card-Assisted PATAYA (Solar System Puzzle) Learning Media

The validity test was carried out to measure the validity of the card assisted PATAYA learning media by conducting a questionnaire assessment by 2 experts, namely a media expert and a material expert. The results of the validity test on card assisted PATAYA media are presented in the following table.

Table 3. Card-Assisted PATAYA Media Validity Test Results by First Stage Expert Validator (Before Revision)

Validator	Validity Percentage	Criteria
Media Expert	92.50%	Very Valid
Materials Expert	76%	Valid

After revisions were made based on criticism and suggestions from media and material experts, the validity results were obtained which are presented in the following table.

Table 4. Card-Assisted PATAYA Media Validity Test Results by Second Stage Expert Validator (After Revision)

Validator	Validity Percentage	Criteria
Media Expert	98.75%	Very Valid
Materials Expert	86%	Valid

The results of the media validity test in the first and second stages are presented in the following diagram.

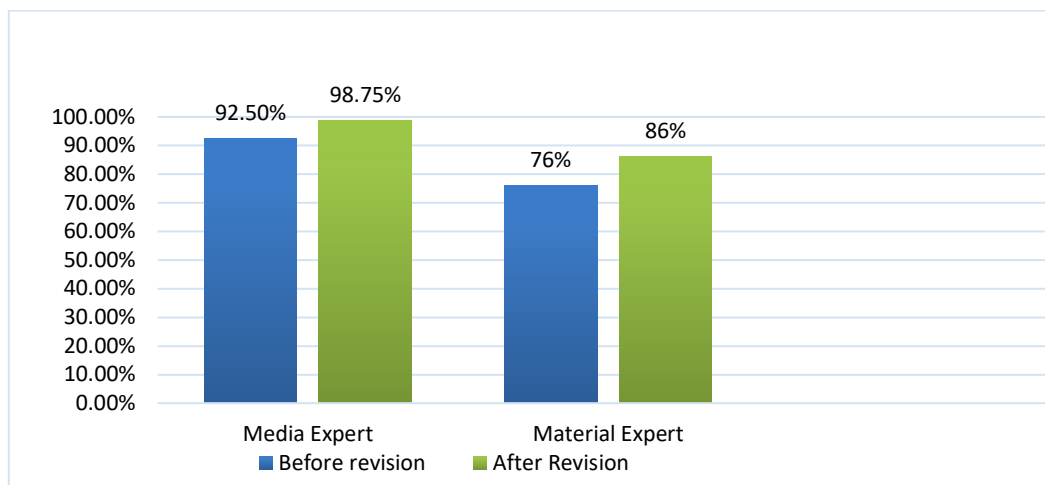


Figure 11. Percentage results of card assisted PATAYA media validity tests by expert validators

Based on the diagram image, it is known that the assessment given by Mr. Muhammad Tahir, S. Pd., M. Sn, as media expert validator, card assisted PATAYA (Solar et al.) learning media has increased from the first stage (before revision) to obtain a percentage of 92.5% to the second stage (after revision) to 98.75% which is included in the very valid category. The percentage increase was obtained after the design was revised based on suggestions and criticism provided by media expert validators, namely replacing the background according to its original condition and enlarging the writing on the media to make it easier for students to read. This is the opinion of Sari (2019) that a teacher needs to use backgrounds and images that are close to real (concrete) situations in a medium. Astuti et al. (2018) added that it is necessary to pay attention to the size of the letters in the media to make it easier for readers.

Based on the assessment given by Mr. Muhammad Syazali, M. Pd, as a material expert validator, the suitability of the material contained in the card assisted PATAYA (Solar et al.) learning media has increased from the first stage (before revision) to a percentage of 76% which is included in the category quite valid to the second stage (after revision) to 86% which is included in the valid category. The percentage increase was obtained after the design was revised based on suggestions and criticism provided by the material expert validator, namely changing the animated image of the planet to an image from a real photo of the planet and adding one complete solar system puzzle. Gilang et al. (2017) explained that the correspondence between pictures and illustrations in the material presented is useful for helping teachers explain and help students understand the material easily. Therefore, the media must be presented as well as possible to easily understand the message the teacher wants (Rahmatih et al., 2018).

Based on the assessment given by the media expert validator and material expert in the validity test, the card assisted PATAYA (Solar et al.) learning media is very valid for classroom science learning. These results support previous research conducted by Mugianto, Fathul Niam, and Widiarini (2022), who developed jigsaw puzzle media and obtained results that the media developed was valid.

3.2. Practicality of Card-Assisted PATAYA (Solar System Puzzle) Learning Media

The practicality of card assisted PATAYA learning media was measured through trials conducted by researchers. The trials were carried out 2 times, namely trials on a small scale and trials on a large scale. The test results of user responses to card assisted PATAYA media are presented in the following table.

Table 5. Test Results Card-Assisted PATAYA Media User Responses at the Small-Scale Product Testing Stage

User	Score	Percentage	Criteria
1 Teacher	50	100%	Very Practical
16 Student	850	96.59%	Very Practical

Table 6. Test Results Response from Users of Card-Assisted PATAYA Media at the Large-Scale Use Trial Phase

User	Score	Percentage	Criteria
1 Teacher	50	100%	Very Practical
30 Student	1611	97.63%	Very Practical

The percentage results of the practicality of card-assisted PATAYA learning media at the small-scale product trial stage and the large-scale use trial stage are presented in the following diagram.

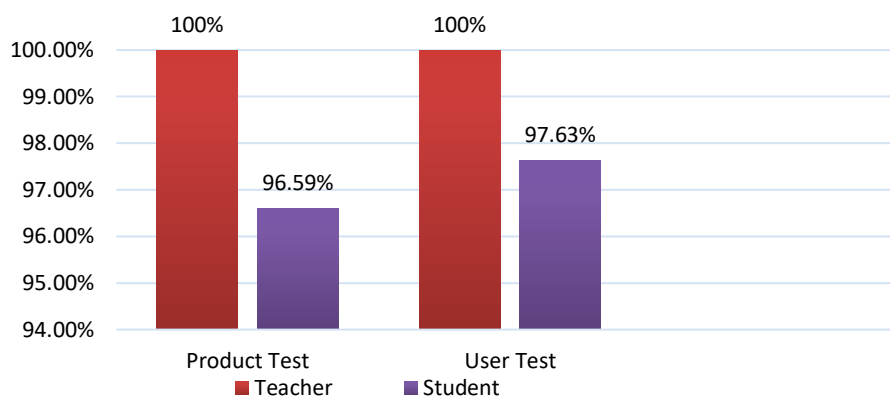


Figure 12. Results of the percentage of practicality of card assisted PATAYA media based on user responses

Based on the diagram image, it is known that at the small-scale product testing stage, the teacher's response to the card assisted PATAYA (Solar et al.) learning media obtained a response percentage of 100%, which was included in the very practical category and from student responses obtained a percentage of 96.59% which fell into the very practical category. Meanwhile, a larger-scale usage trial involved 1 class teacher and 30 Sisxt grades students at SDN 30 Cakranegara. The teacher's response to the card assisted PATAYA (Solar et al.) learning media obtained a response percentage of 100%, which was included in the very practical category, and student responses obtained a percentage of 97.63%, which was included in the very practical category, so this media is interesting and easy used in learning. This aligns with Saputra et al. (2022) that learning media can attract students' attention in learning to foster students' curiosity. The use of learning media in the classroom must be adjusted to student characteristics, especially student learning styles. Kurniati et al. (2019) said that teachers are encouraged to create learning according to the characteristics of students with different learning styles so that students can more easily understand the material presented by the teacher. If teachers adapt learning to students' different learning styles, students' interest in learning will be created and formed (Falah & Fatimah, 2019). Of the several types of learning styles, it is known that Sisxt grades students at SDN 30 Cakranegara have visual and kinesthetic learning styles and have a character who likes to do things in groups.

This potential can be utilized in choosing appropriate media so that student participation in science learning becomes more active and meaningful. Media becomes a communication tool when the learning process takes place and can provide meaningful experiences for students (Hasan et al., 2021). Therefore, puzzle media is chosen and adapted to the characteristics of students with visual and kinesthetic learning styles and like learning in groups by researchers. Narulita et al. (2021) explained that puzzle media can help students be active and participative in the learning process, attract attention so that students do not get bored, and makemake it easier for students to remember the material because it can provide interesting visualizations. Apart from that, these results support previous research reported by Manuarti and Putra (2021), which also revealed that puzzle media is very good to use because it makes it easy for teachers to convey the material and makes it easier for students to understand the learning material.

4. CONCLUSION

From the research results it can be concluded that the development of card assisted PATAYA (Solar System Puzzle) learning media can be used in Sisxt grades science learning at SDN 30 Cakranegara. For greater clarity, the results of the research can be presented, namely first, the design for developing card assisted PATAYA (Solar System Puzzle) learning media using the Sugiyono model through several research stages including the potential & problem stage, data collection, product design, design validation, design revision, product trials, product revisions, usage trials, and product revisions. Second, the level of validity of the card assisted PATAYA (Solar System Puzzle) learning media is said to be very valid. Third, the level of practicality of the card assisted PATAYA (Solar System Puzzle) learning media is said to be very practical.

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