Media Development The Power of Photosynthesis Game Versus Social and Science Learning Outcomes for Elementary School Students

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ABSTRACT. Natural & Social Sciences (IPAS) is a subject that integrates the basic concepts of natural sciences (IPA) and social sciences (IPS). The purpose of this research and development is to find out the development procedure, feasibility, effectiveness, media The Power Of Photosynthesis Game photosynthesis material. The research was carried out at MI Al-Samiun Ngluyu, Nganjuk Regency, with a total of 25 students in grade IV. The research method used is the RnD method with the ADDIE research model. The results of media development show that (1) The Power Of Photosynthesis Game media is in accordance with class IV photosynthesis materials that are attractively designed. (2) Media expert I rated it 80% ("feasible") and media expert II rated it 95.53% ("very feasible"), while material expert I gave scores of 97% and material expert II 94.44%, declaring it "very decent." Pretest-posttest experts also rated it 97% ("very decent"). (3) Pretest-posttest results showed improvement: small group pretest averaged 56.2, posttest 80.2; large group pretest averaged 50.3, posttest 79.8. The t-test produced a t-count of -20.649, lower than the t-table (-2.09302), and the N-gain result was 0.5940 ("moderate"), meaning that The Power Of Photosynthesis Game media was interesting and improved student learning outcomes.

Keywords: media development, natural and social science, the power of photosynthesis game, learning outcomes.

INTRODUCTION

Education is a teaching process on learning that is directed to develop potential and improve the quality of a person's life, intellectually, morally, socially, and physically. Education aims to create individuals who are educated, civilized, and able to actively participate in the life of society and the state.

Natural and Social Sciences (IPAS) is a science that studies living things and inanimate objects in the universe and their interactions, and studies human life as individuals as well as social beings who interact with the environment.

Science is a subject related to the characteristics and natural phenomena that occur in the environment. One of the topics in science material can be found in the discussion of biology, namely photosynthesis. Photosynthesis is one of several topics that students need to understand at the elementary / middle school level which will later make students to know about what processes will occur in plants.

Based on the results of interviews conducted by researchers at MI Al-Samiun Ngluyu Nganjuk, it was found that the students' learning outcomes and the delivery of material to teachers were only fixed on the LKS and the whiteboard as an intermediary. The focus of students is often divided because the teacher is too quick to explain the learning material, while based on the results of the observations that the researcher has made during the learning process, it is known that

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students are less enthusiastic about science material, especially in photosynthesis which is difficult to understand. This is evidenced by the fact that students are less active in asking questions and there are some students who play alone without listening to the explanation given by the teacher.

This is evidenced by the results of daily tests carried out by teachers on photosynthesis materials. The results of the test were obtained by several students whose scores did not meet the KKTP (Minimum Completeness Criteria Component). Students who have not reached KKTP are 62.5% while those who meet KKTP are only 37.5% of students. Students who have not reached the KKTP (Minimum Completeness Criteria Component) get an average score of 56.

According to Piaget, children aged 7-12 years are at the concrete-operational thinking stage, which is a period when children's mental activities are focused on real objects or on various events that they have experienced (Mia, 2022). This is not seen in the learning of photosynthetic material. Photosynthetic material is one of the abstract materials that has terms that are difficult to memorize. The material is also complex because it involves various networks in interrelated plants, so the right learning media is needed to help maximize learning activities. Learning media can be briefly presented as something (it can be in the form of tools, materials, or circumstances) that is used as a communication medium in learning activities. By referring to the problems that have been analyzed by researchers, students need fun and interesting learning media. In addition, so that teaching and learning activities are more active. One of the media that is suitable for dealing with these problems at the concrete stage is using interactive board games.

The Power Of Photosynthesis Game is a type of game-based board game learning media that functions as a tool to hone students' abilities. The power of photosynthesis game media is a game-based media that has different levels of levels including photo posters, photo shorts, photo puzzles, photo labs and crossword photos. The advantages of this learning media include presenting learning materials that can replace teachers to speak continuously in the classroom, and can present games for students to learn. With the development of this learning media itself, students can improve learning outcomes.

According to Bruner, the use of media must be accompanied by a learning theory that supports the learning process, one of which is Bruner's learning theory. Bruner stated that a process of how a person actively selects, retains, and transforms information is the core of learning. In Bruner's learning theory, there are three stages of learning, namely: the enactive stage, the iconic stage, and the symbolic stage (Slamet, 2021).

METHOD

This research uses research and development (r&d) methods. The model used is the addie model, this model consists of five stages, namely analyze, design, development, implementation, and evaluation (tegeh, 2014).
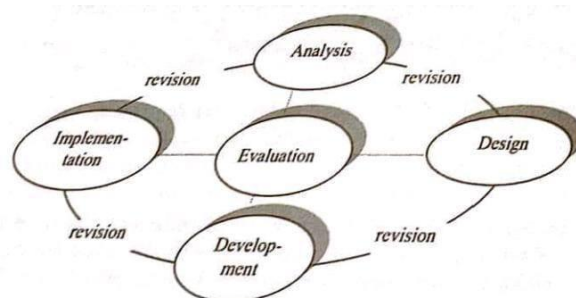

Figure 1. ADDIE Models

(Source: Sugiyono, 2019)

Data Analysis Techniques
Validation Test

To conduct this validity test using *Microsoft Excel* with Aiken's V. Below is the formula for the Aiken's V validity test:

$$V = \frac{\sum s}{n\,(c-1)} \quad (1)$$
<div align="right">(Source : Azwar, 2015)</div>

with: ∑s: The amount of value given by an appraiser, n : Number of Appraisers, c : The highest scoring number (in this case = 4), 1 : Lowest rating

Table 1. Score Aiken's V

Correlation Coefficient	Validation Interpretation
>0.80	Very High
0.60 < V < 0.80	Tall
0.40 < V < 0.60	Enough
0 < V < 0.40	Bad

(Source: Febriandi, 2020)

Reliability Test

(1) If the Cronbach's Alpha value is > 0.60, the questionnaire is considered reliable or consistent.
(2) If the Cronbach's Alpha value is < 0.60, the questionnaire is considered unreliable or inconsistent.

Eligibility Analysis

Table 2. Criteria for Questionnaire Assessment Level

No.	Category	Valuation
1.	Excelent	4
2.	G Good	3
3.	Not Good	2
4.	Very Bad	1

(Source: Riduwan in Fitriyani & Mintohari, 2020)

$$\text{Presentage} = \frac{Total\ score\ from\ validators}{Maximum\ score} \times 100\% \quad (2)$$

If the results obtained reach at least 75%, the product can be categorized as meeting the eligibility criteria so that it can be used.

Table 3. Media Eligibility Criteria

No.	Category	Valuation
1.	<21%	Very Unworthy
2.	21-40%	Not Eligible
3.	41-60%	Quite decent
4.	61-80%	Proper
5.	81-100%	Highly Worthy

(Source: Arikunto, 2009)

Data Posttest Pretest Results
a) Normality Test

The normality test is one of the techniques in analyzing to find out the score on the *one Shapiro wilk test* using the significance provision of α = 0.05, the data is said to be normal if the significance value is > 0.05 while the data is said to be abnormal if the significance is < 0.05 (Ananda, 2018).

b) **T-test**

H0 : There was no significant difference (5%) between before and after using the developed product.

H1 : There is a significant difference (5%) between before and after the use of the developed product.

For two-way t-test decision making:

If *-tcount* < -ttable or tcount > ttable, then H0 is rejected (Ridwan, 2015)

c) **N-gain Test**

Table 4. Criteria for N-gain test results

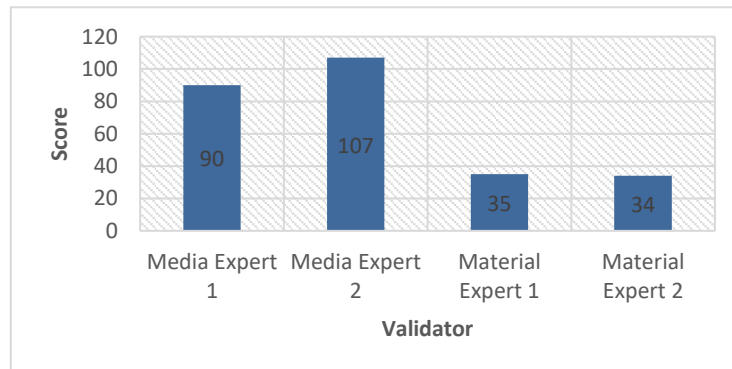| Average	Criterion
$G > 0.7$	Tall
$0.3 \leq G \leq 0.07$	Keep
$0 < G < 0.3$	Low
$G \leq 0$	Fail

(Source: Petra Nahak, 2020)

RESULT AND DISCUSSION
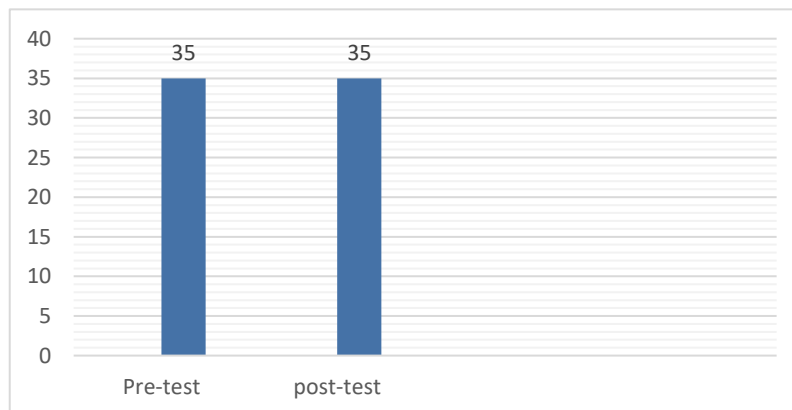
Result

1) Product validation

Diagram 1. Results of Media Expert Validation

2) Validation of *Pretest-posttest Questions* by material experts

Diagram 2. Results of Media Expert Validation of *Pretest-posttest Questions* by material experts

3) Validity Test

TABLE 5. VALIDITY TEST

Assessment	Score				S1	s2	s3	s4	$\sum$s	n(c-1)	V	Ket
	1	2	3	4								
4 Members	90	107	35	34	61	78	25	24	188	258	0,7286822	Tall

In the table above there are the results of the calculation of the value of the product feasibility instrument, having a result of 0.7286822 can be declared high when viewed from the Aiken's criteria table. Data results from questionnaires of product expert validators.

4) Reliability Test

TABLE 6. REABILITY TEST OF REABILITY STATISTICS

Cronbach's Alpha	N of Items
,701	10

In the table above, the results of Cronbach's alpha show 0.701 which means more than 0.60 so it can be concluded that the data used by the researcher is reliable or consistent.

5) Normality Test

The researcher used the *Sapiro-Wilk test* because the number of samples was less than 50 (Mitha, 2014)

TABLE 7. RESULTS OF SMALL GROUP TESTS OF NORMALITY

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	Df	Mr.	Statistic	Df	Mr.
Pretest	,153	5	,200*	,995	5	,994
Posttest	,141	5	,200*	,979	5	,928

Based on the table above, it can be seen that the results of the small group normality test were carried out using *the results of the pre-test* and *post-test*. It is known that the significance value of *Shapiro-Wilk* in the *pre-test* data is 0.994 and in the *post-test* is 0.928, which can be interpreted that the significance of 0.994 and 0.928 is greater than 0.05 can be declared as normally distributed data.

TABLE 8. RESULTS OF LARGE GROUP TESTS OF NORMALITY

	Kolmogorov-Smirnova			Shapiro-Wilk		
	Statistic	Df	Mr.	Statistic	Df	Mr.
Pretest	,167	20	,145	,908	20	,059
Posttest	,084	20	,200*	,992	20	,999

In the table above, it can be seen that the exposure to the results of the normality test of a large group with *a pre-test* result of 0.59 while in the *post-test result* of 0.999, it can be stated that the

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significance of 0.59 and 0.999 is greater than 0.05 that the distribution of data in a large group is normal.

6) T-test

TABLE 9. SMALL GROUP T-TEST RESULTS

| | | Paired Differences | | | | | | | Mr. (2-tailed) |
| | | | | | 95% Confidence Interval of the Difference | | | | |
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	
Pair 1	Pretest – Posttest	- 24,00000	9,02774	4,03733	-35,20941	-12,79059	-5,945	4	,004

The t-count value of -5.945, when viewed with a significance level of 0.025 which is in 2 directions at the df value of 4, has a t-table value of -2.77645 with a rejection area at t-count -5.945. So the decision to reject H0 and accept H1 because t-count = -5.945 < t-table = -2.77645. The level of confidence is 95% that there is a difference before and after the use *of the power of photosynthesis game media.*

TABLE 10. LARGE GROUP T-TEST RESULTS

| | | Paired Differences | | | | | | | Mr. (2-tailed) |
| | | | | | 95% Confidence Interval of the Difference | | | | |
		Mean	Std. Deviation	Std. Error Mean	Lower	Upper	T	df	
Pair 1	Pretest – Posttest	- 29,45000	6,37821	1,42621	-32,43509	-26,46491	-20,649	19	,000

In table 2.3, the results of the t-test of the large group above using *the paired samples test*. With a t-count of -20.649 and when viewed with a significance level of 0.025 in both directions df 19 t-table has a value of - 2.09302, so that the t-count decision making is smaller than the t-table, then reject H0 and accept H1. With a confidence level of 95%, it can be concluded that there is a difference before and after the use *of the power of photosynthesis game media.*

7) N-Gain Test

TABLE 11. SMALL GROUP N-GAIN TEST RESULTS

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	5	,43	,63	,5331	,08516
Valid N (listwise)	5				

The average N-Gain is 0.5331, including less than 0.7 and greater than 0.3, so it can be said to be included in the "medium" category.

TABLE 12. LARGE GROUP N-GAIN TEST RESULTS

	N	Minimum	Maximum	Mean	Std. Deviation
NGain	20	,52	,72	,5940	,05367
Valid N (listwise)	20				

The average N-Gain is 0.5940, included less than 0.7 and greater than 0.3, it can be said to be included in the "medium" category. With this, it was concluded that there were differences in student learning outcomes in the photosynthesis process material in grade IV.

Discussion

The Power *of Photosynthesis Game* media development in science learning uses the ADDIE model which consists of five stages, namely (1) analysis: the researcher analyzes the curriculum and student analysis so that the researcher can find out the existing problems, (2) design: the researcher makes a media concept using flowcharts and Canva applications, (3) development: The media is developed by printing the design, (4) implementation: The media is tested by involving 20 students who are divided into small and large groups, and (5) evaluation: conducted using post-test to measure the improvement of student learning outcomes after using media. This was shown by previous researchers in chapter 1 by Dina Nurhayati, Dedi Supriadi, and Maimunah using the ADDIE development model (Nurhayati, 2021). Using the ADDIE model, this study examines how development occurs. The ADDIE model is a learning design model that has certain stages as an effort to overcome learning problems (Azizah et al, 2023).

The use of learning media can help improve the learning process in the classroom. Therefore, the feasibility of the media is needed based on an assessment that is in accordance with its standards. In the development *of the power of photosynthesis game media*, it is necessary to have a feasibility test to determine whether the media is suitable for students. Based on the research of Uswatun Hidayah and Siti Quratul Ain, it is shown that the feasibility of the media is 97.5% (Uswatun, 2021). In the development *of The Power of Photosynthesis Game*, the feasibility test was carried out by involving media experts, material experts, and experts in pretest-posttest questions. The assessment was carried out in the form of quantitative (feasibility score) and qualitative (criticism and suggestions) data. *The Power Of Photosynthesis Game Media* received satisfactory assessment results from the first and second validators. The results of the media assessment *of The Power Of Photosynthesis Game* received 80% from the first media expert with the feasible category and 95.53% from the very feasible category from the second media expert.

Students' learning outcomes were measured to find out how effective *The Power of Photosynthesis Game* was in improving their understanding. The t-test was used to see significant differences between pretest and posttest results, while the N-gain test was used to see the improvement in learning outcomes. The results of the t-test showed that Ho was rejected and Ha was accepted, which means that there was a significant difference in the learning outcomes of students after using the media. The N-gain test showed a result between 0.3 to 0.7, which is in the medium category, indicating that there is a difference before and after the use *of the power of photosynthesis game media*. With the power *of photosynthesis media, this game* is able to improve the learning outcomes of grade IV students of MI Al-Samiun Ngluyu, this is in accordance with Bruner's theory

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that a process of how a person chooses, maintains, and transforms information actively, the process is the main core of learning.

CONCLUSION

The Power *of Photosynthesis Game* media developed with the ADDIE model is feasible and effective to improve the learning outcomes of science and social studies students with the results of the score from the media expert I 80% declared "feasible" and the media expert II received a score of 95.53% which was declared "very feasible". The feasibility of the material by the material expert I received a score of 97% and the matter expert II received a score of 94.44%, so that the results of the material experts I and II were "very decent". Experts in the pretest-posttest questions received a score of 97% declared "very decent". On average, the small group test pretest with a score of 56.2 and the posttest had a score of 80.2 while the large group test pretest with a score of 50.3 and the posttest had a score of 79.8. In addition, the results of the t-test where the t-count produced at -20.649 is less than the t-table -2.09302 and the N-gain test obtained a result of 0.5940 is declared in the "moderate" category.

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