

The Development of Fishbone Learning Media on the Theme of Animal and Human Movement Organs with a Problem-Based Learning Model to Improve Critical Thinking Skills of Elementary School Students

Mochamad Nanat Fatullo¹, Eko Handoyo², Nuni Widiarti³

¹Master Program, Students of Primary Education, Universitas Negeri Semarang, Semarang, Indonesia

^{2,3}Master Program of Primary Education, Universitas Negeri Semarang, Semarang, Indonesia

Corresponding Author: Mochamad Nanat Fatullo

DOI: <https://doi.org/10.52403/ijrr.20221246>

ABSTRACT

This study aims to analyze the effect of fishbone learning media on the theme of animal and human movement organs with a problem-based learning model in improving critical thinking skills of elementary school students. This development research used the Research and Development (R&D) method. The subjects of a small-scale test were conducted at Asem Elementary School with 15 students in class V, and a large-scale test was conducted at SDN 1 Sidanglout with 30 students in class V. The average media feasibility value is 85.9, which is a very valid category. The average validity value of a material is 87.5, which is a very valid category. The average validity value of the RPP is 85.1, which is a very valid category. Fishbone diagrams with the theme of animal and human movement organs and problem-based learning models effectively improve students' critical thinking skills both from the results of small-scale and large-scale tests. The small-scale test and T-test result (2-tailed) is $0.000 < 0.05$, a significant difference between students' pre-test and post-test.

Keywords: Learning Media, Fishbone, Critical Thinking

INTRODUCTION

21st-century education or the industrial revolution emphasizes 4C skills, one of

which is critical thinking (Jannah & Atmojo, 2022). Critical thinking is the ability possessed by each individual to solve a problem by focusing on processes and steps taken care of that can be accounted for as a duty. Critical thinking leads to analyzing an idea systematically and specifically in distinguishing things carefully and thoroughly. In this case, critical thinking is identifying, studying, and developing these thinking processes using logic and evidence in a perfect direction (Hendi et al., 2020).

Learning media can develop critical thinking (Zulhelmi et al., 2017). Learning media is designed to provide an abstract picture, and its function is to facilitate the delivery of material so that students can easily understand the material (Budiyono, 2020). Learning material on theme 1 is about the movement of animal and human organs that studies the movement systems of animals and humans. After studying this theme, students are expected to be able to understand the function of the organs of movement in animals and humans. However, students have yet to be able to think critically to enrich students' insights and skills.

Based on the results of interviews with several teachers and the actual conditions at school, students need more time to study due to a lack of understanding of the learning

material, especially Theme 1. It happened because several aspects need to be improved, such as learning media that need to be delivered appropriately and monotonous learning methods, causing students' lazy thinking, less critical, and low learning outcomes. Therefore, students need a fun learning method.

Furthermore, the results of preliminary observations related to several learning methods teachers implemented in the learning process, including lectures, discussions, experiments, and questions and answers, have been used. Even though this method tends to be passive and ineffective in increasing learning (Nasrulloh & Umardiyah, 2020), it makes students tend to get bored if they only listen to lectures and ask questions and answers (Mbagho & Tupen, 2020). The teacher feels that delivering learning material still needs to be corrected, so a suitable learning method is required to improve learning outcomes. Because in this study, a problem-based learning model will be used (Problem Based Learning) with the help of learning media.

Previous research conducted by Nurlela (2021) used a fishbone diagram to improve critical thinking skills. The study showed an increase in critical thinking skills with 96.7% completeness. The results of statistical tests show that the use of Fishbone diagrams as learning media can improve students' ability to write exposition texts. Other research on fishbone media can enhance understanding of vocabulary learning (Andiani, 2016) and students show good cognitive, affective, and psychomotor changes (Mulyani, 2016).

Based on the explanation above, it is necessary to research alternative learning media and learning solutions that can improve the critical thinking skills of elementary school students. Therefore, the researcher chose the title "The Development of Fishbone Learning Media on the Theme of Animal and Human Movement Organs Using a Problem-Based Learning Model to Improve Critical Thinking Skills of Elementary School students."

LITERATURE REVIEW

1. Learning Media

According to Hada et al. (2021), learning media is the ease of the teaching and learning process through a tool as an intermediary for delivery so that teachers and students communicate effectively. Teachers have assisted in learning activities, and students become easier to understand and accept the information. Learning media is used in teaching and learning activities to achieve the goals of teachers and students, sharing efforts to analyze information so that the information is helpful and can be used as the basis for continuing learning and making teaching and learning efficient and effective.

2. Characteristics of Learning Media

There are three characteristics of media namely: 1) Fixative characteristics, these characteristics describe the ability of the media to record, store, preserve, and reconstruct an event or object. 2) Manipulative characteristics, the transformation of an event or object is possible because the media has manipulative characteristics. Events that take days can be presented to students in two or three minutes with the time-lapse recording technique. For example, this photographic recording technique can accelerate the larva becoming a cocoon and then a butterfly. 3) Distributive characteristics allow an object or event to be transported through space. Simultaneously, the event is presented to many students with relatively similar experience stimulation by the event (Gerlach & Ely, 1980).

3. Problem-Based Learning Model

The problem-based learning model is a model that involves students solving a problem through the stages of the scientific method. According to Kusumawati et al. (2022), Problem-Based Learning (PBL) is a learning model that involves students in solving problems contextually. This model causes to increase understanding and motivation so that the Problem Based Learning (PBL) model becomes a medium

for students to develop critical thinking. The Problem Based Learning (PBL) model also emphasizes problem-solving activities in learning. Through the Problem Based Learning (PBL) approach, students learn through problem-solving activities that can improve their thinking skills.

The stages of Problem Based Learning model have several stages, including 1) Problem orientation, 2) Organizing students, 3) Guiding individual or group investigations, 4) Developing and presenting work, 5) Analyzing and evaluating problem-solving processes (Ndolu & Tari, 2020).

4. Critical Thinking

Thinking skills that are directed through learning in elementary schools are higher-order thinking skills. One of the higher-order thinking skills is critical thinking skills. Critical thinking skills are the ability to use reason, thoughts, ideas, and creativity to work, develop, make decisions in completing tasks and produce value (Pratami et al., 2022). Meanwhile, Walsh dan Paul in (Ary Ardhini et al., 2021) revealed that critical thinking is interpreting, analyzing, and evaluating information, arguments, or

experiences obtained through a set of reflective attitudes (dispositions) and abilities (skills) so that it guides a person in thinking, believe and act.

METHODS

This study used the development research method (R&D). Fishbone learning media developed refers to the development of Borg and Gall, which was modified by (Sugiyono, 2017) consisting of 10 stages, namely: (1) preliminary study, (2) planning, (3) product draft development, (4) field trials, (5) improvement of the initial product, (6) field trials, (7) perfecting the results of field tests, (8) field implementation tests, (9) final product improvement and (10) dissemination and implementation. These steps are not standard things that must be followed. The steps taken can be adjusted to the needs of researchers; with the necessary changes in research and development, this does not go through steps 4, 5, 6, and 7 due to time, human resources, and cost constraints. The research and development that has been changed, and that can be represented in chart 1:

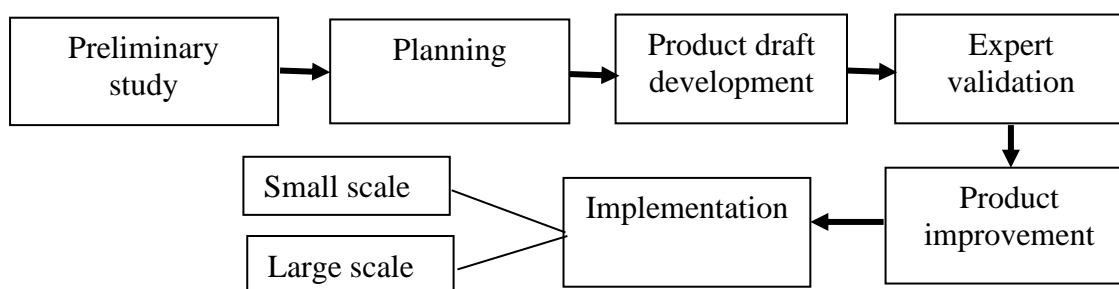


Chart 1 Research Steps

The small-scale test was conducted at SDN Asem, consisting of 15 students of V grade, and a large-scale test was conducted at SDN 1 Sidanglaut, consisting of 30 students of V grade. After the six stages were carried out, the expert validation data analysis was carried out. Questionnaire validation data analysis uses data analysis techniques using the formula proposed by Akbar in Hutama, (2016) as follows:

$$V = \frac{TSEV}{S - max} \times 100\%$$

Explanation:

- V = Review percentage value
- TSEV = Total score of empirical review
- S-max = Expected maximum score

After looking for the percentage, the criteria determined can be seen in table 1.

Table 1 Validation Criteria

No	Criteria	Level Validation
1	75,01% 100,00%	- Very valid (can be used without revision)
2	50,01% 75,00%	- Valid enough (can be used with minor revisions)
3	25,01% 50,00%	- Invalid (cannot be used)
4	00,00% 25,00%	- Very invalid (forbidden to use)

After the expert test was conducted and the product was declared valid, the class test data analysis was conducted, namely the normality test, homogeneity test, t-test, and N-Gain. In addition, there is a distribution of teacher and student response questionnaires to fishbone learning media.

RESULT AND DISCUSSION

Characteristics of Fishbone Learning Media

The characteristics of Fishbone learning media were developed based on the analysis of observations and interviews with teachers. Observation activities are conducted by looking at the learning process in class and observing school infrastructure. Observation and interview activities were carried out to obtain information regarding the needs of teachers and students during the learning process and the learning infrastructure that can support successful learning at SD Negeri 1 Sidanglaut. Based on the results of observations at SD Negeri 1 Sidanglaut, the characteristics of the students' mindsets still need to be more critical. There are still some students who need help solving questions. Students' character continues to develop so that they become whole, virtuous, honest, mature, faithful, and pious individuals. Students at SD Negeri 1 Sidanglaut socialize well with friends or teachers and often greet politely.

Some students are lazy to complete assignments, even though they need to be required to develop knowledge to survive and compete in the 21st century. In every class, someone must be lazy to think but not skip classes. Students usually develop the ability to think when learning or playing. The teacher gives tips on educating students well

by giving examples of good attitudes, providing motivation, and supporting their talents and interests.

In addition, interviews with the teachers were conducted during the learning process. The teacher teaches by lecturing and asking questions about the material being studied. Teachers are guided only by the thematic books the Ministry of Education and Culture published. Teachers follow the lesson plans in the book and do not develop materials or media or make their lesson plans. Students tend to look bored and often ignore the teacher explaining the material. Learning activities are not based on student-centered but still teacher centers. Those learning activities can affect the quality of students' thinking.

Based on the problems that occur, this research develops fishbone learning media on the Theme of Animal and Human Movement Organs with a problem-based learning model to improve the critical thinking of elementary students. The following are the characteristics of the developed products: 1) The media is developed by looking at the infrastructure and simplicity so as not to incur many costs so that educational practitioners can make their own. 2) Based on the essence of learning materials for the locomotor organs of animals and humans. 3) The selection of the theme of animal and human locomotion organs is relevant to fishbone in the form of animals, namely fish.

The Results of Expert Validation and Question Validity

Before the product is tested, the product being developed needs to be validated by experts based on their field. The products developed were tested by media experts, material experts, and lesson plan experts. The results of the assessment of media expert validators, material experts, and the validity of lesson plans can be seen in table 2.

Table 2 Results of the Validity of Media Experts, Material Experts, and Lesson Plan

Aspect	Validator1	Validator2	Rata-Rata	Kategori
Media	87,5	84,3	85,9	Very Valid
Material	85	90	87,5	Very Valid
Lesson Plan	84,3	85,9	85,1	Very Valid

Based on the analysis of validation data, media experts got an average value of 85.9, which is a very valid category. This category can be used for later stages. In line with research by Amirul (2021), media validation is significant in determining the feasibility of media content. Material validation gets an average value of 87.5, which is a very valid category. The appropriate learning materials and media can affect student learning outcomes (Novita et al., 2020).

Furthermore, the lesson plan validation averages 85.1, which is a very valid category. The three aspects are included in the very valid category, so they are feasible to be implemented and tested on a small and large scale. Besides product validation, the questions were tested on 30 fifth-grade students at SD Negeri Picungpugur. The test items consist of validity, reliability, difficulty level, and discriminatory power. The results of the validity test can be seen in table 3.

Table 3 Results of Question Validity

Criteria	Question Number	Total
Valid	1,3,5,6,7,9,11,12,13,14	10 items
Invalid	2,4,8,10,15	5 items

Table 3 shows ten items declared valid. Then, valid questions are further tested for reliability. If the reliability test result is equal to or greater than 0.70, it means that the test has high reliability; conversely, if the test result is less than 0.70, it means that the test does not have high reliability. Furthermore, the level of difficulty of the questions can be seen in table 4.

Table 4 Difficulty Level of Questions

Criteria	Question Number	Total
Very easy	-	0
Easy	1,3,7	3
Moderate	5,6,9,11,14	5
Difficult	12,13	2
Very difficult	-	0

Based on table 4 shows the level of difficulty of relatively easy questions numbers 1, 3, and 7; questions that are classified as moderate are questions 5, 6, 9, 11, and 14, and questions that are classified as complex are 12 and 13. These questions can be used because they are relatively easy and not very difficult. Furthermore, the analysis of different power questions can be seen in table 5.

Table 5 Analysis of Different Power Questions

Criteria	Question Number	Total
Weak	-	0
Currently	-	0
Well	3,12	2
Very strong	1,5,6,7,9,11,13,14	8

Based on table 5, the items classified as good are numbers 3 and 12, while the questions classified as very strong are numbers 1, 5, 6, 7, 9, 11, 13, and 14. These questions can be used for research because they are not in a weak group. Based on the results of data analysis, validity, reliability, difficulty level, and the differential power of the questions were appropriate to measure students' critical thinking levels.

Results of the Effectiveness of Developing Fishbone Learning Media Organs of Animal and Human Movement to Improve Critical Thinking Skills

The product's effectiveness is known by conducting small-scale and large-scale tests and teacher and student responses to the Development of Fishbone Learning Media Organs of Animal and Human Movement to Improve Critical Thinking Skills. The small-scale test was conducted at SD Negeri Asem with 15 students in class V. The results of the small-scale pre-test and post-test can be seen in the diagram in Figure 1.

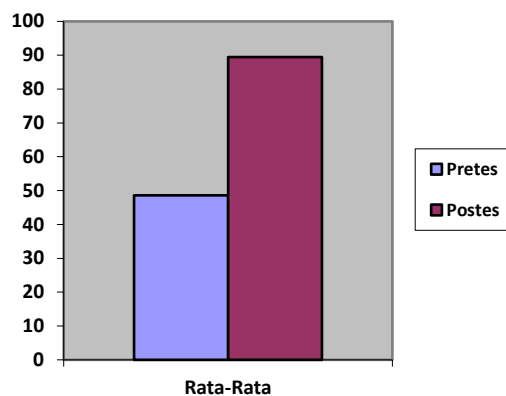


Figure 1 Small Scale Test Results

The results of the effectiveness of fishbone media in the small-scale test showed an average student score of 48.6, and the average post-test score increased to 89.5. Based on the students' final grades, it can be seen that fishbone media effectively increases students' critical thinking.

Furthermore, a T-test was carried out to see a significant difference between the pretest and post-test values. A prerequisite test for normality and homogeneity was conducted first. The normality test results can be seen in table 6.

Table 6 The Results of Small-Scale Normality Test

Tests of Normality							
Results		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Value of	Pre-test	.208	15	.081	.915	15	.164
	Post-test	.203	15	.097	.920	15	.194

a. Lilliefors Significance Correction

Based on the normality test results using the Shapiro-Wilk pretest significance value of 0.164 and post-test of 0.194, the data is normally distributed because the significance

value is > 0.05. After the normality test is carried out, the homogeneity test is carried out. The homogeneity test results can be seen in table 7.

Table 7 The Results of Small-Scale Homogeneity Test

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Value	Based on Mean	.141	1	28	.710
	Based on Median	.117	1	28	.735
	Based on Median and with adjusted df	.117	1	27.555	.735
	Based on trimmed mean	.133	1	28	.718

Based on the homogeneity test results, the significance value is 0.710, meaning that the data has the same variant value. Data is claimed to have the same variance or not

differ (homogeneous) if it has a significance level > 0.05. Furthermore, data analysis was carried out with the T-test. The results can be seen in table 8.

Table 8 The Results of Small-Scale T-Test Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Pre-test Post-test	67.567	21.248	3.879	59.632	75.501	17.417	29	.000

The sig (2-tailed) T-test result is $0.000 < 0.05$, meaning there is a significant difference between students' pre-test and post-test. The results of the t-test show that the development of learning media for the motion of organs, bones, fish, animals, and

humans can improve critical thinking skills and is feasible for large-scale trials. The large-scale test was conducted at SD Negeri 1 Sidanglout with 30 students in class V. The following are the results of the students' pre-test and post-test on the large-scale test.

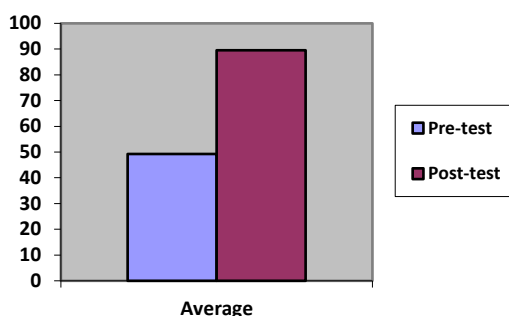


Figure 2 Large-Scale Pre-test and Post-test Results

The results of the effectiveness of fishbone media on large-scale tests mean the average students score is 49.3, and the average post-test score increases to 87.6. Based on students' final grades, fishbone media effectively improves students' critical

thinking. Furthermore, a T-test was carried out to see a significant difference between the pre-test and post-test values. A prerequisite test for normality and homogeneity was carried out first. The normality test results can be seen in table 9.

Table 9 The Results of Large-Scale Normality Test

Results		Tests of Normality					
		Kolmogorov-Smirnov ^a			Shapiro-Wilk		
Value of		Statistic	df	Sig.	Statistic	df	Sig.
	Pre-test	.160	30	.047	.936	30	.070
	Post-test	.167	30	.033	.931	30	.054

a. Lilliefors Significance Correction

Based on the normality test results using the Shapiro-Wilk pretest significance value of 0.070 post-test of 0.054, the data is normally distributed because the significance value is

> 0.05 . After the normality test is carried out, the homogeneity test is carried out. The results of the homogeneity test can be seen in table 10 below.

Table 10 The Results of the Large-Scale Homogeneity Test

Value		Test of Homogeneity of Variance			
		Levene Statistic	df1	df2	Sig.
	Based on Mean	1.320	1	58	.255
	Based on Median	.865	1	58	.356
	Based on Median and with adjusted df	.865	1	51.755	.357
	Based on trimmed mean	1.427	1	58	.237

Based on the homogeneity test results, the significance value is 0.255, meaning that the data has the same variant value. Data is said to have the same variance or not differ

(homogeneous) if it has a significance level > 0.05 . Furthermore, data analysis was carried out using the T-test results in table 11.

Table 11 The Results of Large-Scale T-Test

		Paired Samples Test					t	df	Sig. (2-tailed)
		Paired Differences			95% Confidence Interval of the Difference				
Pair	Pretes - Postes	Mean	Std. Deviation	Std. Error Mean	Lower	Upper			
1		66.983	20.039	2.587	61.807	72.160	25.893	59	.000

The sig (2-tailed) T-test result is $0.000 < 0.05$, meaning there is a significant difference between students' pre-test and post-test. The results of the t-test show that the development of fishbone learning media for the locomotor organs of animals and humans can improve critical thinking skills. In line with research conducted by (Prasmala et al., 2022) and (Pratama, 2022), the use of fishbone media can improve students' critical thinking skills.

Questionnaire Results of Teacher and Students' Responses to the Development of Fishbone Learning Media Organs of Animal and Human Movement to Improve Critical Thinking Skills

The teacher and students' response questionnaire aims to determine how exciting and easy fishbone media is in learning. The questionnaires were distributed after using fishbone media in small-scale and large-scale tests. The following results of the teacher and students' response questionnaire can be seen in table 12.

Table 12 Results of the Teacher and Students' Response Questionnaire

Questionnaires	Average	Category
Students' responses on a Small-scale	81,5	Very good
Students' response on a Large-scale	84,8	Very good
Teachers' Response	90	Very good

Based on the response's questionnaire, learning media for fishbone organs of movement of animals and humans to improve critical thinking skills get a positive response and can be used in learning. They are interested and like fishbone learning media for the movement organs of animals and humans to improve critical thinking skills. In line with research conducted by (Adha et al., 2019) and (Ulfi et al., 2021),

fishbone learning media increases students' attractiveness in the learning process.

CONCLUSION

The development of fishbone learning media on the theme of animal and human locomotion using a problem-based learning model to improve the critical thinking skills of elementary school students is developed based on the characteristics of the environment, students, materials, and problem-based learning models. The feasibility of fishbone learning media on the theme of animal and human movement organs with a problem-based learning model to improve critical thinking skills of elementary school students gets scores from media validator experts, materials, and lesson plans. The feasibility value of the media got an average of 85.9, which is a very valid category. Material experts gave an average value of 87.5, which is a very valid category and lesson plan experts gave an average value of is 85.1, which is a very valid category.

The effectiveness of fishbone on the theme of the organs of movement of animals and humans with a problem-based learning model to improve the critical thinking skills of elementary school students is effective for the learning process. It can improve students' critical thinking based on the results of small-scale and large-scale tests. The small-scale test and the sig (2-tailed) T-test result is $0.000 < 0.05$, meaning there is a significant difference between students' pre-test and post-test.

Declaration by Authors

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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- How to cite this article: Mochamad Nanat Fatulloh, Eko Handoyo, Nuni Widiarti. The development of fishbone learning media on the theme of animal and human movement organs with a problem-based learning model to improve critical thinking skills of elementary school students. *International Journal of Research and Review*. 2022; 9(12):403-412. DOI: <https://doi.org/10.52403/ijrr.20221246>
