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The Development of Teaching Materials Based on Context and Creativity to Increase Students Scientific Literacy

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THE DEVELOPMENT OF TEACHING MATERIALS BASED ON CONTEXT AND CREATIVITY TO INCREASE STUDENTS SCIENTIFIC LITERACY

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Abstract

This research aimed to develop context-based teaching materials and creativity to improve elementary school students' scientific literacy in the material of human and animal motion organs. The research method used in this research is Research and Development (Research and Development) which includes stage 1) Preliminary studies in the form of literature studies, 2) Study of teaching material development and 3) limited trials using a one-shot case study. The results of the analysis of the data from the questionnaire assessment of teaching materials by material experts showed that the aspect of content eligibility was 90%, the feasibility aspect was 78% presentation, the aspect of language eligibility was 83% and the aspect assessment was context and creativity 92%. The results of the questionnaire data analysis of teaching material assessment by media experts showed that the size of teaching materials was 69%, the cover was 86% and the content design was 85. Therefore, the teacher's response to context-based teaching materials using questionnaire sheets, and the response obtained that using teaching materials can facilitate teachers to learn science in a simple but meaningful way.

Keywords: *Context; Creativity; Scientific Literacy; Scientific School; Teaching Materials.*



A. Introduction

Success in a rapidly changing world is determined by the ability to improve knowledge and life skills. The education system in Indonesia needs to lay a strong foundation to fulfill knowledge and skills and strengthen the capacity and motivation of young people to continue learning. Science should be seen as a way of thinking to gain an understanding of nature and its properties, a way to investigate, how natural phenomena can be explained as a body of knowledge generated from human curiosity. Using an understanding of these fundamental aspects, a science teacher (IPA) can be helped when they convey to students a more complete and comprehensive picture of the scientific universe (Tursinawati, 2016).

Teachers and students desperately need learning resources in the teaching and learning process. It must be realized that one of the determining factors in improving the quality of teaching is to improve the quality of learning resources. Textbooks are one source of knowledge for students in schools which are a means that greatly supports the process of teaching and learning activities. Textbooks determine the success of students' education in studying at school. Therefore, good and quality textbooks in addition to being a source of knowledge that can support student learning success can also guide and direct the teaching and learning process in the classroom towards a quality learning process as well. A good textbook is a book that is a source of knowledge, so it can be a good medium and will help optimize the teaching and learning process as expected above. This type of book is expected to help the teaching and learning process that is effective and efficient so that it can improve the quality of education, especially Science education (Center for Bookkeeping of the Ministry of National Education, 2003).

The teacher does not only use one textbook in conveying learning information in class but there is a need for supporting teaching materials to complement the shortcomings contained in the textbook. Teaching materials make students feel satisfied in getting material or information. The development of teaching materials is important to be done by the

teacher because developing teaching materials can help students. Students not only have a textbook used as teaching material but can be more than one and it can help students to develop their insights and make it easier for them to obtain information. For students who do not have textbooks, it will be helped by teaching materials made by the teacher, so that they can keep learning and get satisfying learning outcomes like their friends who have textbooks and can improve their scientific literacy skills (Kaylene & Rosone, 2016; Hudha et.al., 2019; Sunarti et.al., 2018).

One of the easiest teaching materials made by teachers is teaching material in printed form. In the process of developing teaching materials, teachers also should not just make it. Everything must be made systematically. The contents of teaching materials must also interest students or readers. Because the purpose of developing teaching materials is to help students in getting alternative teaching materials besides textbooks. In addition, so that learning activities become more interesting [Jalil et.al., 2019; Rizaldi et.al., 2020].

The textbooks that have so far emphasized the dimensions of content rather than the dimensions of the process and context as demanded by PISA are the main factors that should be suspected to have caused the low level of literacy of Indonesian children in PISA (Firman, 2007; Acosta, 2016). According to the Organization for Economic Cooperation and Development (OECD, 2010), scientific literacy is defined as the capacity to use scientific knowledge, identify questions and draw conclusions based on facts to understand the universe and make decisions from changes that occur due to human activities. Scientific literacy is important to be mastered by students concerning how students can understand the environment, health, economics, and other problems faced by modern societies that depend heavily on technology and the advancement and development of science (OECD, 2003).

Based on PISA in 2006 the average value of the Indonesian children's literacy science component is below the ability scale which places Indonesia at 50th place out of 57 countries below Thailand which has an average value of 421 occupying the 46th position. At this level of



ability, students are generally only able to remember facts, terminology, and laws of science and use scientific knowledge that is general in taking and evaluating conclusions (Hayat, 2003). The weakness of science learning in Indonesia mainly lies in the knowledge of how process skills are implemented and the orientation of science learning (Nahdi, 2018; Rahmi et al., 2019; Silta and Miharti, 2020; Zahro, 2020).

Based on the observations of researchers at the research location, the teacher only uses one textbook in conveying learning information in class, so there is a need for supporting teaching materials to supplement the deficiencies that exist in the textbook. This problem is also supported by the results of a preliminary study conducted at SD Negeri 2 Peukan Bada. Based on the results of giving literacy questions, it shows that the percentage of students' literacy achievement on the indicators of identifying valid scientific opinions is 39.47%; perform literature search which is effective 40.01%; understand the elements of research design and how they impact the findings/conclusions 30.62%; graph accurately from data 21.00%; solving problems using quantitative skills, including basic statistics 25.00%; understand and interpret the basic statistics of 37.50% and make inferences, predictions, and conclude based on 32.56% quantitative data. This shows that students' scientific literacy is low, so it is necessary to develop context-based teaching materials and creativity to add a handbook for students to improve students' scientific literacy at the Pekan Bada Aceh Besar district primary school. The development of teaching materials is important to be done by the teacher because developing teaching materials can help students. Students not only have a textbook used as teaching material but can be more than one and it can help students to develop their insights and make it easier for them to obtain information.

Based on the description above, researchers are interested in developing context-based teaching materials and creativity in the hope that it can improve students' scientific literacy abilities and all desired goals can be achieved effectively and efficiently so that this study is entitled "Development of Contextual-Based Teaching Materials and



Creativity to Increase Primary School Student Science Literacy ". The formulation of the problem of this research is how to develop context-based teaching materials and creativity to improve elementary school students' scientific literacy? With the aim of research to develop context-based teaching materials and creativity to improve elementary school students' scientific literacy.

B. Method

The research method used in this research is Research and Development (Research and Development) which includes stage 1) Preliminary studies in the form of literature studies, and field studies conducted on 6 fifth grade teachers at Peukan Bada Aceh Besar Elementary School, 2) Study of teaching material development and 3) limited trials using a one-shot case study design on 9 students in class V SDN Lam Awee and wider trials in 28 students in class V SDN 2 Peukan Bada Aceh Besar. Data in this study were collected using a questionnaire assessment of teaching materials by material experts, media experts, teachers, and student responses to teaching materials. Percentage of validator perception can be calculated using the formula:

$$\% \text{ validator perception} = \frac{A}{B} \times 100\%$$

Note: A = number of scores from data collection
B = Total criterion score

Table 1: Criteria for Validation of Teaching Materials

Percentage of Validator Perception	Validation Criteria
80 % ≤ x ≤ 100 %	Very good / very valid / without revision
60% ≤ x < 80 %	Good / valid / without revision
40% ≤ x < 60 %	Good enough / valid enough / a little revision
20% ≤ x < 40 %	Not good / not valid / many revisions
0 % < x < 20 %	Not good / improper / total revision

(Source: Sugiyono, 2009)

According to Trianto (2010) the percentage of student responses is defined as the proportion of students who choose each alternative answer



to each question item divided by the number of students multiplied by one hundred percent which can be written as follows:

$$\text{Percentage of student responses} = \frac{A}{B} \times 100\%$$

Information:

A = Proportion of students who chose each alternative on each statement item

B = Number of students

C. Result and Discussion

1. Result

The development of teaching materials carried out through the Research and Development, Research and Development (R&D) method begins with an analysis of the 2013 curriculum which is followed by an analysis of the need for teaching materials and an analysis of the subject matter, tasks, and learning objectives. This stage is called the stage of research and information gathering. After this stage is completed, then the design of teaching materials is carried out.

The teaching material designed is adjusted to the results of the 2013 curriculum analysis, the purpose of developing teaching materials and materials as well as learning objectives. In addition, in the process of designing instructional materials, a review of examples of teaching materials such as modules from Pursitasari (2019), Association of Schools of Public Health (2013), and Earth System Science Education Alliance (2011). The modules are an inspiration in the development of teaching materials in this study.

The modules each have their format, such as modules from Pursitasari (2019) consists of the Preamble, Intended Learning Outcomes, Reading List, Problem Statement, Question for Class Discussion, and Individual Exercises sections. While the module from the Earth System Science Education Alliance (2011) consists of the Key Concepts, Sources, Related investigation for teachers, and students in the form of Scenarios, Your Task, Resources, and Assignment. The module of the Association of Schools of Public Health Milestones (2013) consists of an Overview of the Case, an Overview to Learning Objectives, an Overview of the Two Sessions, a Facilitator's Guide, Handout 1, and Handout 2. So based on an analysis of

the contents of the three modules, context-based teaching materials and creativity in the material organs of human and animal motion.

The process of developing teaching materials is carried out by taking into account the format of teaching materials in Indonesia, which consists of cover pages, pages in (franchisors), preface, table of contents, position map of instructional materials, introductory sections consisting of descriptions, prerequisites, instructions for using instructional materials, objectives end of learning, competence and ability check. The contents of teaching materials are adjusted to the types of teaching materials in the context of everyday life. The final part of teaching materials consists of a list (glossary), bibliography. The glossary can be placed at the front and can also be placed at the end of teaching materials.

After the process of designing teaching materials is finished, the teaching materials are then validated (reviewed) by experts so that they can be said to be worthy of testing. The process of designing teaching materials and validating teaching materials by experts takes about 3 months, namely 2 months for the design and 1 month for validation. teaching materials are validated using a teaching material assessment instrument that was previously designed and validated by experts teaching instrument assessment instruments based on aspects that need to be assessed for the criteria of a good module.

There have been several revisions made to the design of teaching materials during the development process. The revisions were made, among others, as shown in Table 2.

Table 2: Revisions to the Design of Teaching Materials

No.	Revised Design of Teaching Materials	Results
1.	The upper front cover design should be more attractive	Media expert review
2.	Affix the number and source of the image	Media expert review
3.	Letters and colors of subtitles are corrected	Media expert review
4.	Language in making questions and selecting images more specific	Media expert review
5.	Spelling accuracy	Media expert review



- | | | |
|----|---|---------------------|
| 6. | Concept maps are affixed with conjunctions | Media expert review |
| 7. | The topic of the problem does not yet exist | Media expert review |
| 8. | Tests need additions | Media expert review |
| 9. | The introduction to the test must be following the indicators and learning objectives | Media expert review |

Some changes (revisions) made to the design of teaching materials can be seen in Figure 1 and Figure 2. The revision of the teaching material cover as shown in Figure 1 is done based on the opinion of media experts that the teaching material cover in the upper part of the color design is not good so it needs to be revised with a more concentrated color design so that it is attractive.



Figure 1: The Left Side Cover Design of Teaching Materials Before Validation and The Right Side of Cover Design of Teaching Materials After Validation

The revision of the content of teaching materials from the beginning to the end of the development process is shown by changes in the concept map as shown in Figure 2. Figure 2 shows the change in the addition of conjunctions to connect between concepts. Revisions to teaching materials continued during the development process based on observations of the conditions of learning activities with teaching materials. The development of teaching materials during the trial phase no longer involves experts and the full revision of teaching materials is the responsibility of the researcher.

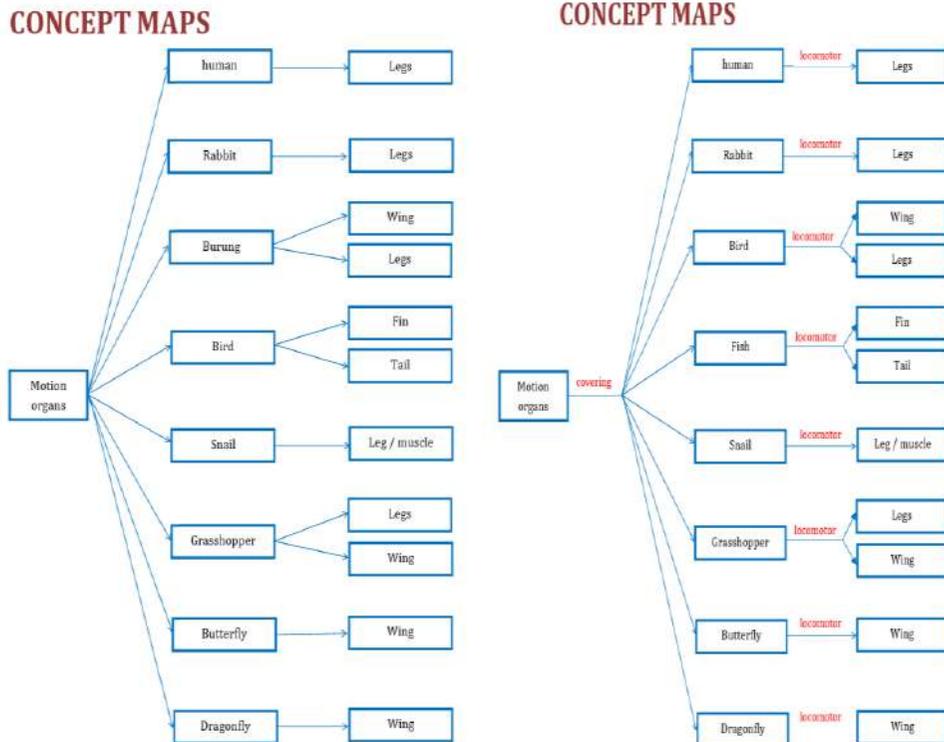


Figure 2: Right Side of the Concept Map Before Validation and Right Side of the Concept Map After Validation

Trials for the development of teaching materials were carried out 2 times. Trials for the development of teaching materials in stage I involved 9 fifth grade students of Lam Awee Peukan Bada Elementary School and trials for developing phase II teaching materials involved as many as 28 fifth grade students of Peukan Bada Second Elementary School. In this trial, each student learns independently with teaching materials that are brought home to home for 3 weeks, after the process of independent learning at home distributed teaching materials assessment instruments for students.

The data collected in the development trial is the student response data to teaching materials that are analyzed by the formula of the percentage of student responses and data on teacher assessment results obtained through the teaching material assessment instrument for



teachers. From the results of this trial, a revision of teaching materials was carried out, ie the grammar used in the teaching material was improved to be simpler and easier for students to understand.

a. Results of Data Analysis of the Teaching Material Assessment Questionnaire

The results of the analysis of the questionnaire evaluation of teaching materials by material experts are presented in Table 3.

Table 3: Results of Analysis of Questionnaire Assessment of Teaching Materials by Material Experts

No.	Assessment Aspects	Percentage of Validator Perception	Validation Criteria
1.	The upper front cover design should be more attractive	90	Very good, without revision
2.	Affix the number and source of the image	78	Good, without revision
3.	Letters and colors of subtitles are corrected	83	Very good, without revision
4.	Language in making questions and selecting images more specific	92	Very good, without revision

The results of the analysis of the data from the questionnaire evaluating teaching materials by material experts showed that teaching materials were appropriate for use in field trials according to material experts without the need to be revised again. The results of the analysis of the data from the questionnaire evaluation of teaching materials by material experts showed that the aspect of content eligibility was 90%, the feasibility aspect was 78% presentation, the aspect of language eligibility was 83% and the aspect assessment was context and creativity 92%.

1) Questionnaire Assessment of Teaching Materials by Media Experts

The results of the analysis conducted on the questionnaire evaluation of teaching materials by media experts are presented in Table 4.



Table 4: Results of Analysis of Questionnaire Assessment of Teaching Materials by Media Experts

No.	Assessment Aspects	Percentage of Validator Perception	Validation Criteria
1.	The size of teaching materials	69	Good, without revision
2.	Cover	86	Very good, without revision
3.	Content design	85	Very good, without revision

The results of the analysis of the questionnaire data evaluation of teaching materials by media experts indicate that teaching materials are appropriate for use in field trials according to media experts and do not need to be revised again. The results of the questionnaire data analysis of teaching material assessment by media experts showed that the size of teaching materials was 69%, the cover was 86% and content design was 85%.

2) Questionnaire Assessment of Teaching Materials by Class V Teachers

The results of the analysis conducted on the questionnaire evaluating teaching materials by five fifth-grade teachers are presented in Table 5.

Table 5: Results of Analysis of Questionnaire Assessment of Teaching Materials by Teachers

No.	Assessment Aspects	Percentage of Validator Perception	Validation Criteria
1.	Display	88	Very good, without revision
2.	Presentation of material	86	Very good, without revision
3.	The benefits	87	Very good, without revision

The results of the analysis of the questionnaire assessment of teaching materials by teachers showed that teaching materials were feasible to be used in wider trials in class V according to class V teachers and did not need to be revised again.



b. Results of Analysis of the Teaching Material Assessment Questionnaire by Students

Analysis of the questionnaire for the assessment of teaching materials by students based on the percentage of answer choices given to students on each statement item obtained the percentage as shown in Figure 3.

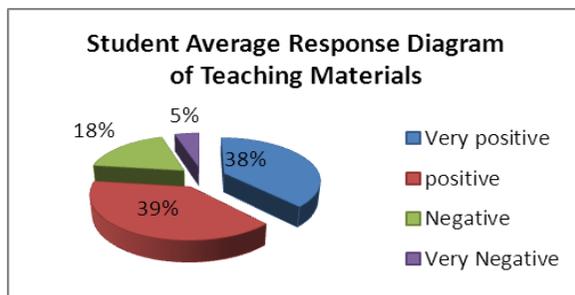


Figure 3: Percentage of Student Responses to Teaching Materials Based on Alternative Answers Given for Each Proposal Submitted

Based on Figure 3, the percentage of student responses to teaching materials is 38% very positive, 39% positive, 18% negative, and 5% very negative. The students' responses are classified only into 2 types of responses, namely positive and negative responses, then the percentage diagram of the response can be presented in Figure 4.

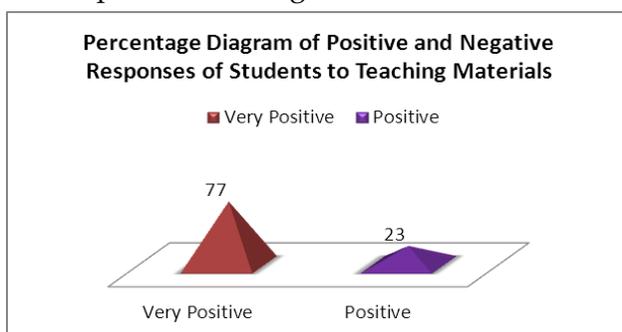


Figure 4: Percentage of Student Responses Based on Positive and Negative Responses to Teaching Materials

Student responses to teaching materials were 77% positive and 23% negative. While the results of responses to each statement submitted in the questionnaire instrument assessment of teaching materials by students are presented in Table 6.



Table 6: Percentage of student responses to Teaching Materials

Rating Indicator	Statement	Percentage of Response	
		Positive	Negative
A. Attraction	1. The display of teaching materials for human and animal organ movements is interesting.	96 %	4 %
	2. Teaching material for human and animal organs makes me more excited about learning science.	64 %	36 %
	3. By using teaching materials, human and animal motion organs can make learning science not boring.	96 %	4
	4. Teaching material for the human and animal organs to support me in mastering science, especially human and animal.	86 %	14 %
	5. Teaching material for human and animal organs makes me very enthusiastic about learning.	43 %	57 %
	6. The illustrations (pictures) can motivate to study the material.	93 %	7 %
B. Theory	7. Submission of material in teaching materials of human and animal organ movements related to daily life.	75 %	25 %
	8. The material presented in the teaching material of human and animal organ movements is easy for me to understand.	46 %	54 %
	9. In teaching materials, human and animal organ movements, there are several parts for me to find my concepts.	71 %	29 %
	10. Presentation of material in the teaching material of human and animal motion organs encouraged me to discuss with other friends.	89 %	11 %
	11. Teaching material for human and animal motion organs	96 %	4 %



		includes assessment tests that can test how far I understand the material of human and animal organs.		
C. Language	12.	Sentences and paragraphs used in teaching material for human and animal organ movements are clear and easy to understand.	86 %	14 %
	13.	The language used in teaching materials human and animal motion organs are simple and easy to understand	43 %	57 %
	14.	The letters used are simple and easy be read.	93 %	7 %

Table 6 shows the variation of students' responses to teaching materials. These variations indicate the advantages and disadvantages of teaching materials that are developed based on the perspective of students as users of teaching materials. Positive responses were given by students to teaching materials based on statements submitted in the teaching material assessment instrument when testing is limited and wider trials can each be considered in Table 7. By paying attention to Table 7 it can be seen the impact of the revisions made on teaching materials based on student responses. Student responses to teaching materials in limited trials and wider trials vary widely. The variation of responses given by students shows the effect of revisions made to teaching materials during the process of testing teaching materials and the direction of the development of teaching materials to be better or not [Tias et al, 2018].

Table 7: Positive Responses Provided by Students at Each Stage of Teaching Materials Trial

Rating Indicator	Statement	Percentage of Responses	
		Limited Trial	Wider Trials
A. Attraction	1. The display of teaching materials for human and animal organ movements is interesting.	67 %	96 %



	2. Teaching material for human and animal organs makes me more excited about learning science.	56 %	64 %
	3. By using teaching materials, human and animal motion organs can make learning science not boring.	100 %	96 %
	4. Teaching material for the human and animal organs to support me in mastering science, especially human and animal.	78 %	86 %
	5. Teaching material for human and animal organs makes me very enthusiastic about learning.	44 %	43 %
	6. The illustrations (pictures) can motivate to study the material.	89 %	93 %
B. Theory	7. Submission of material in teaching materials of human and animal organ movements related to daily life.	67 %	75 %
	8. The material presented in the teaching material of human and animal organ movements is easy for me to understand.	56 %	46 %
	9. In teaching materials, human and animal organ movements, there are several parts for me to find my concepts.	78 %	71 %
	10. Presentation of material in the teaching material of human and animal motion organs encouraged me to discuss with other friends.	78 %	89 %
	11. Teaching material for human and animal motion organs includes assessment tests that can test how far I understand the material of human and animal organs.	67 %	96 %
C. Language	12. Sentences and paragraphs used in teaching material for	56 %	86 %



	human and animal organ movements are clear and easy to understand.		
13.	The language used in teaching materials human and animal motion organs are simple and easy to understand	67 %	43 %
14.	The letters used are simple and easy be read.	78 %	93

2. Discussion

The advantage of learning with independent teaching materials is that students' motivation increases because students work on assignments according to their abilities (Utomo, 1991). Learning with independent teaching materials does not require students to get the same results for each aspect of the assessment but each aspect of the assessment is mutually integrated to complement each other so students can develop following their competencies/talents. In addition, independent teaching materials also make students actively learn, namely students trying to dig up information from various sources so that students get optimal learning outcomes. Learning becomes useful for students, so students increasingly enjoy each learning activity.

Teaching materials developed with a context-based approach are teaching materials that relate to the real world making students interested and binding curiosity and make students challenged to complete it. This is what makes learning with context-based teaching materials can increase students' scientific literacy.

Also in learning with this teaching material, the teacher's role is as a facilitator who guides students to explore deeper understanding and supports student initiatives but does not give lectures on concepts that are directly related to the essential problem being solved and also does not direct or provide a solution that is easy for students. This makes students exert all their abilities to solve difficulties faced and train students to do assignments independently which is an indicator of students having a high interest as stated by Sardiman (2006) regarding indicators of

someone having high interest. The results of this study are supported by Windyariani's research (2016) which shows that teachers' responses to context-based teaching materials use questionnaires and responses obtained that using context-based teaching materials and creativity can facilitate teachers to learn science in a simple but meaningful way.

Knapp and Schell (2001) suggest that learning in contexts that provide students with much experience using what is learned identifies and solves problems in new contexts. Schools don't need to teach too much content but teach little content in a good way. By focusing on less content, the teacher will convey ideas gradually in a variety of contexts to provide deepening and reinforcement of material for their students. Thus students have a rich and deep insight rather than just getting a lot of discussions but shallow (Tjalla, 2009).

Practicing creative abilities is also raised in teaching materials. Creativity needs to be developed in students because through creativity one can actualize himself (self-actualization), provide satisfaction (satisfaction), and through creativity will be able to improve the quality of life for someone (Ardianto, 2016).

All teachers and all those who contribute both as implementers of teaching and who have an influence on teaching science at the elementary school level must have responsibility for the achievement of scientific literacy by their students. Teachers should be willing to implement educational innovations so that there is renewal by raising issues or problems in the community in the classroom.

E. Conclusion

Based on the results of research that has been carried out on the development of context-based teaching materials and creativity to improve the scientific literacy of fifth-grade elementary school students in the Human and Animal Motion Organs material, the results of data analysis from the questionnaire evaluating teaching materials by material experts indicate that the aspect of content eligibility is 90%, aspects the



presentation eligibility is 78%, the aspect of language eligibility is 83% and the aspect assessment is context and creativity is 92%. The results of the questionnaire data analysis of teaching material assessment by media experts showed that the size of teaching materials was 69%, the cover was 86% and content design was 85%.

The results of the analysis of the questionnaire evaluation of teaching materials by teachers showed that the display material was 88%, the presentation of the material was 86% and the benefit was 87%. While the students' response to teaching materials was 77% positive and 23% negative. So it can be concluded the teacher's response to context-based teaching materials using questionnaire sheets, and the response obtained that using teaching materials can facilitate teachers to learn science in a simple but meaningful way.

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