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The Design of Development of Context and Creativity Based Teaching Materials to Improve Scientific Literacy for Grade V Elementary School Students

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Abstract: This development research develops Context and Creativity-based teaching materials to improve the scientific literacy of fifth-grade elementary school students. This research is motivated by the 2013 curriculum teaching materials that do not display the context and creativity of elementary school students so that students' scientific literacy is low. This development research uses the Borg & Gall development model which uses ten steps, namely research and data collection, planning, development preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, dissemination, and implementation. The design of the development of teaching materials starts from planning, processing, and evaluation to produce teaching materials that are appropriate to the context, student creativity, and increase scientific literacy. The teaching materials were tested on students and teachers and validated by linguists, materials, and media. From the student and teacher response data as well as the validation of the validator, effectiveness was tested through the t-test.

Keywords: Teaching materials, context, and creativity, scientific literacy

1. Introduction

Indonesia always ranks low in education quality surveys. The Organization for Economic Cooperation and Development (OECD) announced the results of the 2018 Program for International Student Assessment (PISA) Indonesia's ranking was unsatisfactory. PISA is an evaluation of the education system of OECD participating countries which is conducted every three years (OECD, 2018). The survey was conducted on students aged 15 years from randomly selected schools around the world, emphasizing three main points, namely literacy, mathematics, and science. In 2018 measuring the ability of 600 thousand students aged 15 years from 79 countries, Indonesia is still in the lowest rank, namely the 6th from the bottom (74) out of 79 countries.

Scientific literacy is the ability to implement the knowledge that students have to solve problems in real life (Toharudin et al., 2011). More and more problems in the world related to science and technology are increasing and every member of society is required to be involved in making decisions to solve problems (Gung et al., 2009).

The results of their research stated that to improve scientific literacy teachers must be creative in developing problem-based questions (Norris & Phillips, 200). From the results of these studies, learning science needs stages that allow students to solve problems based on the context of problems in everyday life, experiment with concepts, and develop them to be applied to new concepts.

From the explanation above, the problem of learning is the low scientific literacy needs to be improved. To improve scientific literacy, teachers need to develop problem-based questions in the context of problems in everyday life, an experiment from concepts, and develop them to be applied to new concepts.

Based on observations of five grade five teachers, the facts were obtained during learning, the teacher in learning still refers to the teacher's book and students book, as a companion using worksheets, in teaching materials learning does

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not begin with the student's prior knowledge or does not fit the context, does not present problems that students often face in real life, the teacher also still applies conventional learning models. So students are less able to solve real-life problems that are presented in the learning evaluation. The average daily test score for class fie students is still low and there are still many who have not reached the minimum completeness criteria.

One way that can be done to improve the quality of learning is by using teaching materials. Teaching materials that can make students active. Able to solve problems in their lives by using the concepts of knowledge that have been learned. Presenting assignments according to their creativity, understanding lessons well, and organizing their knowledge.

The use of context-based teaching materials and creativity is felt to be able to solve problems in learning. SDN Pangkalan students have similar problems, namely being less happy to summarize material during learning. They are more interested in playing, singing, drawing, or activities that produce something that demands creativity. Based on these considerations, this research was conducted with the title "Context-Based Teaching Material Development and Creativity to Improve Science Literacy for Class V Elementary School Students"

The development of Context and Creativity-based teaching materials is considered capable of improving the scientific literacy of fifth-grade elementary school students (Oluwaleyimu et al., 2020). So in the design of the development of teaching materials through the stage of planning of developing teaching materials, and evaluating the development of teaching materials.

2. Context and Creativity Based Teaching Materials

2.1 Teaching Materials

The Ministry of National Education states that the development of teaching materials should pay attention to the principles of learning (Depdiknas, 2008). The learning principles in question are as follows.

- Starting from the easy to understand the difficult, from the concrete to understanding the abstract: students will find it easier to understand a certain concept when explaining starts from easy or something concrete and tangible in their environment.
- Repetition strengthens understanding: repetition is needed so that students better understand a concept. In the repetition of teaching material, it is presented appropriately and varies.
- Positive feedback will reinforce student understanding: the response given by the teacher to the student will be a reinforcement for students.
- High motivation to learn is a determinant of learning success: motivation can be done by giving praise, hope, explaining goals and benefits, giving examples, or telling something that makes students happy to learn.
- Reaching a goal is like climbing a ladder, the teacher needs to arrange suitable rungs to achieve learning objectives, these steps are formulated in the form of competency indicators.
- Knowing the results that have been achieved will encourage students to achieve goals, the teacher is like a guide for a trip to a destination. In learning each child will achieve these goals at their own pace but will arrive at the goal even though at a different time.

2.2 Context and Creativity Based

In context-based learning, context is used as a starting point for developing scientific thinking (Bennett et al., 2006). The main purpose of a context-based approach is to present scientific concepts to students through selected activities in everyday life, which can increase their motivation so that they are interested in learning science (Barker & Millar, 1999). Selected activities in daily life that are considered to be able to increase the motivation of elementary school students with games or songs related to science so that they are interested in learning science.

Creativity is potential that every human being has and not one that is received from outside the individual. In this life, creativity is very important, because creativity is an ability that is very meaningful in the process of human life (Semiawan, 2009), creativity is the ability to provide new ideas and apply them in problem-solving. Creativity is a person's ability to give birth to something new, both in the form of ideas and real work, both new and a combination of those that already exist.

In context-based learning and creativity, the teacher links the concept of science to the context of students' or students' daily lives then leads students to think creatively in solving problems related to science. This is expected to improve students' scientific literacy, namely solving problems in everyday life related to science.

Several factors affect a person's scientific literacy skills (Hariadi, 2009). Several factors that influence scientific literacy in a person are; student attitudes towards science, educational background of parents, self-confidence, and motivation to learn science, time to study science (Sudjana, 2006) state that one of the efforts that can be made to improve scientific literacy skills is to improve the quality of learning.

2.3 Science Literacy

According to the OECD (Organization for Economic Cooperation and Development), scientific literacy is defined as a person's scientific knowledge that is used to identify questions, acquire new knowledge, explain scientific phenomena, draw conclusions based on evidence, understand the characteristics of science as a form of human knowledge and investigation (Sintian, Kiting, & Wilson, 2021). Awareness of how science and technology shape our materials, environment, intellectuals, and culture, as well as a willingness to engage in science issues and science-related ideas as reflective as students. Scientific literacy consists of three dimensions is a measurement, namely :

- Aspects of Context of Science Applications
  According to Rustaman et al. (2003), the real situation that becomes the context for the application of science in PISA is not specifically raised from the material studied in school, but rather from everyday life.
- Aspects of the Science Process
  PISA defines three aspects of the process components in the assessment of scientific literacy, namely identifying a scientific question, explaining phenomena scientifically, and using scientific evidence OECD (2009).
- Aspects of Science Content
  Science content refers to the key concepts used to understand natural phenomena and the changes made to nature through human activities. PISA determines the criteria for science content as follows: 10 relevant to real-life situations, 2) it is important knowledge so that its use is long-term, 3) suitable for the level of development of children aged 15 years (Firman, 2007).

Scientific literacy provides excellent benefits for the development of students. Students can have provisions to solve problems that will be faced later and be ready for the increasingly unlimited developments in information technology (Roslan et al., 2021). Scientific literacy makes a person study each problem at hand. Explain the results of the study carried out, look for solutions to problems according to the data obtained, then choose the best solution according to the study data.

Setiawan (2018) and Kondo et al. (2007) The role of science, scientific thought and activities, science and society, mathematics in science, and motivation and belief in science (Adisendjaja & Oom, 2008) Science literacy consists of four indicators, namely design knowledge, investigation of the nature of science, science as a way of thinking, and literacy of science, technology, and society. According to PISA, indicators of scientific literacy are grouped into 3 competencies, namely explaining phenomena scientifically, designing and evaluating scientific investigations, and interpreting scientific data and evidence (Kondo et al., 2010). Based on these utterances, the indicators of scientific literacy in Indonesia are based more on the results of the PISA assessment. These indicators are explaining phenomena scientifically, designing and evaluating scientific investigations, and interpreting scientific data and evidence.

Existing research is used by a researcher as reinforcement in selecting the title including research Windyariani & Sutisnawati (2016), shows that research on the development of context and creativity teaching materials is valid, practical, and effective. Suratno (2009) research states that the development of creativity in elementary school students is very important. Rosana (2014) examines developing student soft skills in context-based learning to improve the quality of the process and learning outcomes. Balfas (2008) in his research the learning objectives of applying the experience of learning outcomes into the use of practical needs.

3. Research Methods

The research used the research and development design of Borg and Gall. Sukmadinata (2006) Borg and Gall describe ten steps for implementing a research and development strategy which includes: research and information collecting, planning, develop a preliminary form of product, preliminary field testing, main product revision, main field testing, operational product revision, operational field testing, final product revision, dissemination, and implementation.

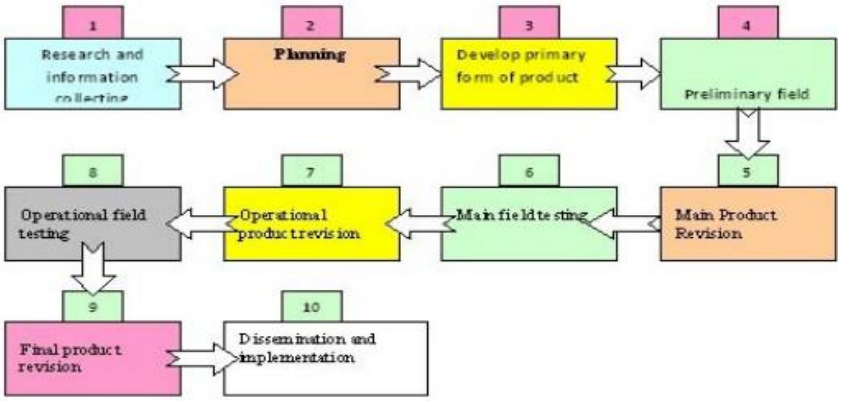

Fig. 1: Borg and Gall R & D Procedure Chart (Sukmadinata, 2006)

Adopting from Borg and Gall's R&D research procedures, the steps in this study are:

a. Research and data collection was carried out by conducting interviews, analyzing the scores of students' daily tests, studying literature, and preparing for the research framework.
b. Planning carried out is planning the objectives of developing teaching materials, selected materials, learning models, and equipment that must exist.
c. The initial development of teaching materials was carried out in determining the appearance of the cover, pictures, language, material discussed, and the stages of learning. At this stage, the initial product of teaching materials is produced.
d. Initial field trials, initial trials were limited to 10 grade V elementary school students. In this initial trial, students filled out a questionnaire on student responses to the initial product of teaching materials. The questionnaire includes aspects of language, material, and media.
e. Revision of product I was carried out based on a student response questionnaire regarding the initial product of teaching materials. The deficiencies presented in the questionnaire were revised to get teaching material products that were by the needs of students.
f. Field trial II was conducted on 21 students in the experimental class. By distributing student response questionnaires. This questionnaire is used as a reference for making revision II of teaching materials.
g. Revision of product operation, namely making product improvements from the results of the second trial, so that the product developed is ready to be validated.
h. Expert validation, validation is carried out by linguists, material experts, and media experts on teaching material products.
i. Revision of the final product, namely making final improvements to the development of teaching materials to produce the final product according to the wishes of the validated students.
j. We have indirectly done product dissemination by following seminars, publishing them in national journals, and socializing with teachers.

Through product testing, data is obtained. The trial was carried out on students, teachers, and validators by filling in student and teacher response questionnaires, filling out the questionnaire by the validator. Furthermore, teaching materials or final products are produced that are suitable for the context, creativity of students and can improve students' scientific literacy that has been validated by experts. The data collected were in the form of student and teacher response questionnaires, validation questionnaires for linguists, material experts, and instructional material media experts. The questionnaire contains the statement that has been adjusted to the desired teaching material. The effectiveness test of teaching materials was carried out to determine the extent to which this teaching material could improve students' scientific literacy.

4. Result and Discussion

The design of the development of teaching materials is prepared by adjusting the conditions in the field. To see conditions in the field, interviews were conducted with five grade V elementary school teachers. From the results of the interview, it was found that the existing teaching materials were not in the context of students, student creativity and were less effective in increasing students' scientific literacy.

The design of teaching materials development starts from planning, process, and evaluation. These components are interrelated in producing the final teaching materials that have been developed. The development of teaching materials is expected to increase students' scientific literacy.

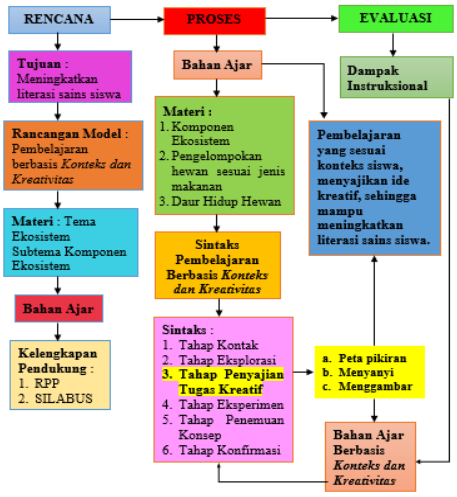

Fig. 2: Teaching Material Development Design

The development design begins with a plan by formulating goals to be achieved, namely increasing students' scientific literacy. From the aim of improving scientific literacy to design an appropriate learning model, namely Context and Creativity with material that has been determined by grade V elementary school, the theme of ecosystem sub-theme of ecosystem components. From the objectives, models, and materials, it was decided to prepare teaching materials with complete lesson plans and syllabus.

From this plan, the process of developing teaching materials that are appropriate to the context of students is then carried out, presenting creative ideas so that they can increase scientific literacy. Then determine the material, namely the first learning ecosystem components, the second learning namely the grouping of animals according to food types, and learning the five animal life cycles. The material is presented in teaching materials that refer to Context and Creativity-based learning syntax. The learning syntax includes six stages, namely, contact, exploration, presentation of creative assignments, experiments, concept discovery, and confirmation (Windyariani & Sutisnawati, 2016).

At the stage of presenting creative tasks developed in teaching materials, for the first lesson, it presents a mind map of the material that has been studied. The second lesson presents a creative task through singing by singing a song with the tone of the song “Lihat Kebunku” and the lyrics are changes in the grouping of animals according to the type of food they eat. The fifth lesson presents creative tasks through drawing, namely drawing the stages of animal metamorphosis according to students' creative ideas. The development of the learning syntax is presented in Context and Creativity-based teaching materials. The teaching material also refers to the syntax in Context and Creativity-based learning. The development of the context of students presents creative tasks so that student scientific literacy increases (Faiyun, Santosa, & Susatya, 2020).

After carrying out the teaching material development process, the next stage is evaluation. We can see this evaluation through the instructional impact when applying teaching materials from students, teachers, and teaching material validators. To produce the final product based on Context and Creativity teaching materials.

5. Conclusions

Based on the results of research of context and creativity-based teaching materials, it can be concluded that this study uses the Borg and Gall development research procedure which uses ten development steps. The design of the development of teaching materials is prepared by adjusting the conditions in the field. To see conditions in the field, interviews were conducted with five grade V elementary school teachers. From the result of the interview, it was found that the existing teaching materials were not in the context of students, student creativity and were less effective in increasing students' scientific literacy. So it takes teaching materials that can fit the context of students, display students' creative ideas, and can improve scientific literacy. The design of teaching materials development starts from planning, process, and evaluation. These components are interrelated in producing the final teaching materials that have been developed, the development of teaching materials is expected to increase students' scientific literacy.

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