



The Development of Worksheet Based on Problem Based Instruction to Improve Critical Thinking Skill of Students



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Abstract

The research's problem begins with a needs analysis in learning. This study aims to produce worksheet products based on problem-based instruction that are feasible and effective in improving students' critical thinking skills. This research is a Research and Development (R&D) type of research. The development is carried out referring to the theory of Borg & Gall. The population of this research is the fifth-grade students of SD Gugus Ki Hajar Dewantara, Metro, Lampung. Subjects in this study were determined using a purposive sampling technique obtained by as many as 41 students. The data collection tool uses a valid and reliable test instrument. The data analysis technique used N-Gain. The results showed that the worksheet developed was feasible and effective in improving students' critical thinking skills.

1. Introduction

Education is a conscious effort made by educators to help students improve their knowledge, attitudes, and skills. Education will guide humans to have the ability to be able to compete in the life of society in the future. Education is implemented as an effort to support future development. Bailey (2006) explains that education that can support development in the future is education that can develop students' potential so that students can face and solve the problems they face. Education can be appropriately implemented if it has guidelines used as a reference in its implementation (Sari et al., 2021).

The 2013 curriculum includes four aspects of assessment, namely spiritual aspects (KI-1), social aspects (KI-2), knowledge aspects (KI-3), and skills aspects (KI-4). The 2013 curriculum is

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implemented as an alignment of education with the demands of the times, the demands of technological developments, and the demands of the skills possessed by students and referring to the abilities needed in the 21st century based on Higher Order Thinking Skills (HOTS). Bialik & Fadel (2015) explain that students' abilities in the 21st century are creativity, critical thinking, communication, and collaboration. Students must possess these four abilities because they can improve students thinking skills so that students can face problems in the current learning process and problems in their lives in the future. This is supported by research from Alismail & McGuire (2015), which explains as follows.

One of the essential elements that must be a concern to encourage economic growth and the nation's competitiveness in the era of the industrial revolution 4.0 is to prepare a more innovative learning system and increase the competence of graduates who have 21st-century skills (Learning and Innovations Skills). There are many opinions about what 21st-century skills are, one of which is the 4C (Critical thinking, Creativity, Collaboration, and Communication).

These skills must be supported by the ability to accelerate the availability of big data and make decisions independently, well, and responsibly. One of the abilities that students in 21st-century learning must possess is thinking critically. Lai (2011) states that critical thinking can enrich students' thinking power to innovate to achieve learning objectives optimally. Critical thinking skills are fundamental for students to understand the material during the learning process. Ster and Taylor in Dewi (2020) argue that "critical thinking can be thought of as a toolbox of skills which enable children to think more deeply and clearly about what they believe and what they read or are told in the media act and about what they should do." Black (2005) suggest that students who can think critically are considered better able to understand the scientific process and become better at asking questions which are basic abilities of independent study and investigation.

Several factors undoubtedly influence the critical thinking ability of students. Maslow suggests that the factors that influence students' critical thinking skills are physical conditions, motivation, emotional states, intellectual development, and individual intelligence (Freitas & Leonard (2011). Stobaugh (2012) "... critical thinking is deeply processing knowledge to identify connections across disciplines and find potential creative solutions to problems". Bellemare et al (2013) suggest that the learning environment is made conducive to developing students' critical thinking skills by having four factors, namely stimulated student interest, creating an atmosphere of a meaningful discussion, exposure to the views of others, and fostering an atmosphere of mutual trust and support.

The observations and interviews showed that there were still weaknesses in the learning process carried out in the classroom. Educators have not fully involved in the activity of students, so learning tends to be centered on educators. The learning materials provided by educators tend to complete the material in the student handbooks so that they do not emphasize increasing students' critical thinking skills. Mostly, teaching materials used in the learning process are less attractive, and some educators use teaching materials produced by publishers that do not necessarily follow students' needs.

In the learning process, students' critical thinking skills can be improved by carrying out creative and innovative learning, such as using learning models and teaching materials that can stimulate students in their critical thinking processes. The success of the learning process requires educators to carry out meaningful learning. One way that educators can use is to use a learning model. Learning models provide direction to educators in achieving learning objectives. An educator acts as a facilitator in the learning process so that it can run well. Educators must be innovative in finding ways

so that learning is carried out to be fun and students can build their knowledge. Of the many learning models used, the problem-based instruction learning model can be applied in the thematic learning process. Implementation of learning using this model can help students solve problems in the implementation of learning.

Johnson et al. (2019) explain that learning with the PBI model begins with a problem (which can be raised by students or educators). Students deepen their knowledge about what they already know and what they need to know to solve the problem. Students can choose problems that are considered attractive to solve so that they are encouraged to play an active role in learning. The PBI model can provide a rich experience for students because it increases students' understanding of what they are learning so that they are expected to be able to apply it in natural conditions in everyday life.

Read (2015) explains that the provision of teaching materials and teaching methods that are dynamic, conducive, and dialogical is essential for the optimal development of students' potential. Potential in students can be developed if there are tools that support the implementation of learning. One of the tools used in the learning process is Student Worksheets. Choo et al. (2011) explain that Worksheets are an instructional tool consisting of a series of questions from information designed to guide students to understand complex ideas as they work systematically. The use of Worksheets in the learning process is expected to guide students to be able to think critically to improve student learning outcomes. Based on the description of the background above, researchers are interested in developing problem-based instruction-based worksheets for fifth-grade elementary school students.

2. Materials and Methods

This research is a type of research and development research referring to the steps of developing Borg & Gall (Aka, 2019). The WORKSHEET developed is a problem-based instruction-based Worksheet for fifth-grade elementary school students. The product development steps are as follows.

Initial Information Collection

Data collection begins with analyzing reference sources, class observations, identification of problems found, and determination of appropriate solutions to overcome these problems. At this stage, the researchers conducted a questionnaire on the needs of public elementary schools throughout the Ki Hajar Dewantara Cluster of Metro City. Based on the questionnaire results, it was found that the learning problems experienced by students were the low learning outcomes of students.

Planning

The planning determined by the researcher includes several steps, namely, first, the researcher makes an instructional analysis consisting of learning objectives, mapping of core competencies (KI), Basic Competencies (KD), and indicators for fifth grade elementary/MI students. In the second step, the researcher collects teaching materials following the material sourced from relevant books. Third, the researcher makes a draft Worksheet adapted to the problem-based instruction steps. At this stage, the preparation of the WORKSHEET draft includes titles, work instructions, KD mapping, assignments, and supporting materials. The fourth stage is making a worksheet that has been prepared, and the fifth stage is planning evaluation tools.

Early Product Development

After planning the material to be developed according to learning needs, the next step is to develop the initial product. The initial product development in this research includes preparing learning materials, preparation of handbooks, and evaluation tools. The development of the initial form in the form of a problem-based instruction-based Worksheets product draft in thematic learning of Theme 6 Sub-theme 1 for fifth-grade students of State Elementary Schools in the Ki Hajar Dewantara Cluster of Metro City.

Initial Stage Test

The initial test was carried out to test the validity and reliability of the developed instrument. Instrument validation was carried out by targeting material expert lecturers, media experts, and linguists and practitioners. First, expert validation test by material, media, and language experts. The results of the expert validation test are in the form of comments, criticisms, suggestions, and assessments of the Worksheets products that have been prepared. An expert validation test is used to revise the product design until a feasible and valid design is obtained. Furthermore, the validation test was carried out by fifth-grade educators at SDN 6 Metro Barat. The validation test was carried out to provide criticism and suggestions for improving the developed WORKSHEET until it was ready to be tested for the next stage.

Initial Product Revision

Initial product revisions are based on suggestions and input from validation experts and practitioners. This activity is carried out to improve the problem-based instruction-based Worksheet product.

Main Product Trial

Revision of the main product is carried out based on suggestions and input on the product developed. It produces Worksheets based on problem-based instruction that is feasible to improve students' critical thinking skills.

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3. Results and Discussions

Feasibility of Worksheets Product Development Based on Problem Based Instruction

The results of research and development of problem-based instruction-based worksheets that were developed "properly" in class V thematic learning Theme 6 Heat and its Transfer Subtheme 1 Temperature and Heat. The development of these problem-based instruction-based Worksheets

adapts the R&D step by Borg & Gall (1983: 784) using seven out of ten steps. The development of problem-based instruction-based Worksheets begins with the collection of initial information. After researchers know the problems, researchers plan to develop Worksheets that students will use. Furthermore, the researchers compiled the initial product development of the Worksheets. In this step, the researcher sets out the pattern of development that will be outlined in problem-based instruction-based worksheets.

a. Material expert validation

Material expert assessment is based on aspects of Worksheets conformity with problem-based instructions and content suitability. The product revision suggested by the material expert is rechecking the typo on the script. The white writing in the learning objectives section tends to be invisible to students. It is recommended to replace it with black and background that the reader can read. Every PBI step/syntax must be reflected in each subject. Revisions need to be made regarding images, substance, writing, and others. The problem-based instruction-based Worksheets product validation test results obtained a score of 93, which was included in the excellent category.

b. Media Expert Validation

The media expert's assessment includes a description of the contents of the Worksheets, presentation of pictures and tables, conformity of the content with technical requirements, graphics, worksheets cover design, and Worksheets design. Product revisions based on media expert advice, namely the writing of adjusted layouts, the use of images adapted to the theme and development of students, and the stages of activities adjusted to the PBI paradigm with the appropriate layout. The validation test results by media experts got a score of 87.5, which was included in the outstanding category.

c. Linguist Validation

Linguistics assessment includes straightforward, communicative, and using terms, symbols, or icons. Product revision is based on the advice of linguists, namely correcting the spelling to conform to the General Guidelines for Indonesian Spelling (PUEBI). The validation test results of linguists got a score of 91, which was included in the very good category. The recapitulation of expert validation results is presented in the table.

Table 1. Recapitulation of Validation Results

No	Validation	value	Description
1	Theory	93	Very Valid
2	Language	87,5	Very Valid
3	Media	91	Very Valid

The Effectiveness of Problem Based Instruction-Based Worksheet on Improving Critical Thinking Ability

The effectiveness test was conducted to determine the effectiveness of problem-based instruction-based worksheets in the learning process that had been implemented. The effectiveness test was conducted on 21 fifth-grade students of SD Negeri 6 Metro Barat. The Worksheets being tested includes six sub-theme, one theme that has been previously designed.

The observation of student learning completeness obtained data that 18 students completed and two did not complete. Based on the effectiveness test using N-Gain, data was obtained that there was an increase in the average N-Gain value of students before and after learning was carried out using problem-based instruction-based worksheets. The calculation results are presented in the table.

Table 2. Total N-Gain

No	Aspect	<i>Pre</i>	<i>Pos</i> <i>t</i>	<i>N-Gain</i>	Description
1	Amount	1145	16 25	11,30	1129,6
2	Average	57,25	81, 25	0,56	56,5
				Currently	Effective enough

The effectiveness of problem-based instruction-based worksheets in improving students' critical thinking skills is supported by calculation data for increasing students' critical thinking skills on each indicator using N-Gain. The calculation results can be seen in the following table.

Table 3. Recapitulation Of Critical Thinking

No	Critical Thinking Indicator	<i>N-gain</i>	Description
1	Solve the problem	0,90	Very high
2	Synthesize	0,51	Currently
3	Analyze	0,43	Currently
4	Evaluate	0,60	Currently
5	Conclude	0,69	Currently

Subsequently, a test was conducted to prove the significance of the differences between the two groups using the independent sample t-test (attachment 29, page 197). Based on the results of calculations with $DK = 39$ and a significance level of 0.05 (5%) obtained $t\text{-count} = 5.51 > t\text{-table} = 2.021$, then H_a is accepted, and H_o is rejected. It can be concluded that there are differences in students' critical thinking skills with using problem-based instruction-based worksheets with those that do not use the fifth-grade elementary school students.

The differences that occur are caused by problem-based instruction-based worksheets in the experimental class, making students understand better. In line with that, the effectiveness of problem-based instruction-based worksheets is also strengthened by the results of research conducted by Handayani et al. (2021), suggesting that the problem-based instruction model assisted by e-learning can improve students' critical thinking skills. Furthermore, the results of research conducted by Dirgantara (2020) show that applying the problem-based instruction model can improve learning outcomes and students' critical thinking skills.

Based on the explanation above, it can be concluded that problem-based instruction-based worksheets are effectively used in the learning process and can improve the critical thinking skills of fifth-grade elementary school students.

4. Conclusion

Based on the analysis of research and development data, it is concluded that the problem-based instruction-based Worksheets product developed is suitable for use. This is evidenced by the results of the material expert validation which obtained a value of 93 which was included in the very valid category, the media expert's validation value of 87.5 was included in the very valid category and the value of the linguist validation was 93 with the very valid category. Based on the suggestions and validation results, problem-based instruction-based worksheets are appropriate for teaching materials in class V Elementary School. Problem-based instruction-based worksheets are effectively used in fifth-grade students' learning process at SD Negeri 6 Metro Barat to improve students' critical thinking skills. This is evidenced by an increase in the average pretest and posttest scores of students who obtained an N-Gain score of 0.57 in the medium category. Further testing was carried out to prove the significance of the differences between the two groups using the independent sample t-test. Based on the results of calculations with $DK = 39$ and a significance level of 0.05 (5%) obtained $t\text{-count} = 5.51 > t\text{-table} = 2.021$ then H_a is accepted and H_o is rejected, so it can be concluded that there are differences in students' critical thinking skills with using problem-based instruction-based worksheets with those that do not use the fifth-grade elementary school students.

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