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Development of IPAS Textbooks Based on Problem Based Learning Model Grade V Students of Elementary Schools in Gebog Sub-District

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Abstract: The objectives of this study are: 1) to analyze the needs of IPAS textbooks based on Problem Based Learning (PBL) developed for fifth grade students in Gebog Kudus District; 2) to describe the development of IPAS textbooks based on Problem Based Learning (PBL) for fifth grade students; 3) analyzing students' learning outcomes using the IPAS textbook based on Problem Based Learning (PBL). The study conducted is a Research and Development (R&D) study or development research. The outcome of this study is a teaching book on IPAS that is based on Problem Based Learning (PBL). The data collection methods utilized include observation, interviews, tests, and documentation. Qualitative data analysis consists of data reduction, data presentation, and conclusion/verification. Meanwhile, quantitative data analysis involves instrument testing and effectiveness testing. The validation results of the teaching materials conducted by two expert validators showed that the material validation score is 85% (valid), and the media validation score is 87% (valid). The normality test results for the pre-test value is 0.203 ($p>0.05$), while for the post-test value is 0.461 ($p>0.05$), indicating a normal distribution. The t-test results found a significance value of 0, which is smaller than $\alpha = 0.05$. This means that there is a significant difference between the average pretest and post-test scores. The N-gain score is 76.19 (greater than 0.7), falling under the "high" category, indicating high effectiveness. The research findings indicate that the integration of Problem Based Learning (PBL) approach can enhance students' overall understanding and learning outcomes.

Keywords: learning outcomes, IPAS, Problem Based Learning, teaching materials

1. Introductions

Education is a very important activity in human life. Usually, education is carried out in the family, school and community environment. Education should be prioritized because every learner has diverse potentials within themselves. Education is a process that aims to direct learners to adapt to their environment optimally.

Improving the quality of education continues to be done through curriculum development. Curriculum development is one of the strategies to improve educational achievement. Regulation of the Minister of Education and Culture number 65 of 2013 concerning Process Standards for Primary and Secondary Education emphasizes the importance of discovery-based learning, problem-based learning, and an emphasis on scientific thinking skills (ScientificApproach). In learning activities, students are more directed to find their own answers through a series of activities that support the process of finding answers.

In the independent curriculum, the government gives educators the freedom to create quality learning that suits the needs and learning environment of learners, focuses on essential, relevant and in-depth material to build creativity and innovation, and is tailored to the context and local content.

In the explanation of Danis & Panggabean (2022), it is stated that the learning process requires learning resources that contain information needed for learning. This learning resource has a very important role in the learning process, because it can help learners to gain cognitive, affective, emotional, belief, and feeling knowledge. Yolanda & Wahyuni (2020), the development of textbooks is considered the key to motivating students to learn independently without continuing to rely on teacher assistance. By using quality textbooks, the learning process in the classroom will become more effective.

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The preliminary study was conducted at SD 5 Jurang, Gebog Sub-district, Kudus Regency by observing and gathering information. Based on the results of observations and information that in learning IPAS at SD 5 Jurang several problems were found. Among them are learning activities in class V SD 5 Jurang lack of direct observation and experiments on the material being taught, so that students seem to only listen to teacher explanations and memorize textbooks, textbooks used are fixated on text material and questions, and lack of developing student activities that are directly related to the students' environment.

IPAS learning outcomes based on the odd semester summative score of semester 1 at SD 5 Jurang in the 2023/2024 school year obtained data that of 17 students, 6 students or 35% managed to exceed KKM 70, the lowest score was 67 and the highest score was 82. The implementation of learning in class V SD 5 Jurang is still not optimal. In learning, students and teachers currently only rely on learning resources provided by the government, such as student books and teacher books. In fact, the independent curriculum actually requires the use of various sources, media, and textbooks to support the learning process.

Initial observations were made at SD 3 Lau, Dawe District on November 9, 2023. In grade V of the school, learning still uses textbooks from the government in the form of teacher books and student books. However, the teacher has not completed the learning by providing LKPD so that the learning process becomes more interesting and not boring because it is still focused on practice questions. Initial observations were also made at SD 3 Jurang, Gebog Subdistrict on November 16, 2023, the teacher has utilized the print out of the package book with the LKS companion book which contains the main materials and worksheets. Although textbooks from package books are used, they have not reached the optimal level in meeting the needs of students.

In this context, it is important for teachers to design learning modules that are interesting and effective in improving students' learning achievement, especially in terms of increasing their interest in learning science and strengthening their curiosity. One of the learning methods that can be applied is the problem-based approach. This approach utilizes problems as a central point to develop learners' ability to solve problems.

Kistian (2019) showed that the application of the Problem Based Learning (PBL) model can improve students' learning outcomes. Other findings from Yuda et al., (2016) and Utaminingsih & Amitabh (2021) also confirmed that Problem Based Learning (PBL) plays an important role in improving students' speaking skills by encouraging them to be active in finding solutions to problems. (Kerans & Ngongo, 2021)also stated that through Problem Based Learning (PBL) science teachers can share experiences and exchange ideas to find solutions to various problems that are often faced in their respective schools and collectively develop lesson plans and can improve scientific work skills and student activeness.

Based on the explanation above, the researcher developed learning materials entitled "Development of IPAS Textbooks Based on Problem Based Learning Model for Grade 5 Elementary School Students in Gebog District."

1.1 Conceptual framework

1.1.1 Textbook

Textbooks, according to (Andi, 2015) are systematically arranged materials that meet the demands of the curriculum, containing competencies that students must have so that they can learn to use these materials to achieve certain goals. According to research conducted by Cakici et al. (2012), textbooks can be interpreted as any type of material used to assist teachers or instructors in carrying out the learning process. This textbook can be in the form of written or unwritten material.

Teachers are expected to develop textbooks that can make it easier for students to understand learning (Restuningtyas et al., 2019). Meanwhile, according to Lim (2016), textbooks can provide easy access so that students can learn anytime and anywhere. The right textbook has proven to be significantly effective in improving student learning outcomes (Lestari & Parmiti, 2020).

Textbooks can be divided into two types based on their subject. First, textbooks that are intentionally designed for the learning process such as books, LKS, handouts, and modules. Second, textbooks that are not intentionally designed as learning resources but can be used in the learning process such as clippings, newspapers, movies, advertisements, and news. Andi (2015) explains that the elements of coursebooks include: competencies to be achieved, supporting information, exercises, work instructions or worksheets, evaluation

1.1.2 IPAS Materials

Ilmu Pengetahuan Alam dan Sosial (IPAS) represents a combination of Science and Social Studies incorporated into the independent curriculum, with the intention of motivating children to oversee their environment and social interactions as a unified entity (Setyawati, 2023).

Ilmu Pengetahuan Alam dan Sosial (IPAS) encompasses a cohesive body of knowledge that investigates both living entities and non-living matter within the universe and their interactions, while also exploring human existence as an individual and a social entity that engages with its surroundings ((Sukma et al., 2021) ; Widiyastuti et al., 2023)).

Ilmu Pengetahuan Alam dan Sosial (IPAS) is one of the subjects in elementary school where students are encouraged to develop their independence in learning. This is because Science is viewed as an active learning process. The learning process in Science does not merely require students to remain passive and listen to explanations from the teacher; rather, students are expected to seek information independently and directly. This approach aims to sharpen students' curiosity and provide opportunities for exploration in finding answers through various outdoor activities. One of the objectives of the Science subject is to develop skills in natural research, problem-solving, and making sound decisions (Wardani et al., 2023).

Ilmu Pengetahuan Alam dan Sosial (IPAS) is designed to avoid rote learning, necessitating that educators provide material that is straightforward and accessible to students. The goal of science education in elementary settings is to prepare students to gather information effectively and apply it within the established learning system. The educational process should ideally extend beyond the simple transmission of information (Sari et al., 2023).

1.1.3 Problem Based Learning (PBL)

One of the learning methods applied in the Merdeka Curriculum is the Problem Based Learning (PBL) learning model. Problem Based Learning (PBL) is a learning approach that provides real challenges or problems to students, so that they can learn while looking for solutions to these problems.

Problem Based Learning (PBL) is an interesting learning method where learners are directly confronted with a problem and then they search for information themselves. In this method, students become the center of the learning process. Puspita et al. (2018). The goals of Problem Based Learning and experimental methods are aligned in their aim to boost the active participation of students in learning, offer direct learning experiences, and cultivate scientific attitudes in students Lathifa et al. (2025).

According to Abbas (2000), Problem Based Learning (PBL) is a learning method that uses real-world problems as a context for students to develop critical thinking skills and skills in solving problems. The implementation of a problem-based learning model includes five stages, namely: orienting students to authentic problems, 2) organizing students, 3) guiding individual and group investigations, 4) developing and presenting work, 5) analyzing and evaluating the problem- solving process. The

By utilizing such a learning model, students are expected to develop the ability and be afforded the opportunity to interact with their friends to exchange thoughts and express their views, with the teacher taking on the role of a facilitator, as the learning is completely centered around the students (Wardani et al., 2023).

The Science module based on Problem-Based Learning is appropriate for incorporation into the Merdeka Curriculum for fifth-grade students in elementary school (Noviani & Ismaya, 2023).

1.1.4 Learning Outcomes

Learning outcomes refer to the abilities that students acquire following their educational activities (Elsani et al., 2020). These outcomes represent the skills gained by individuals after the learning process, which can lead to changes in behavior, including knowledge, understanding, attitudes, and skills, thereby improving students beyond their previous state (Febrianasari, 2023). According to Mustakim (2020), learning outcomes encompass all achievements attained by learners, assessed according to specific criteria established by the educational institution's curriculum.

1.2 Research Objectives

This study used a research and development (R&D) design. According to Dick et al. (2009), R&D is a research method used to create specific products, and test the effectiveness of these products. According to Sugiyono (2013), the research and development method is a research method used to create certain products and test how effective these products are.

This research was conducted in primary schools in Gebog Sub-district in the even semester of (2023/2024 from January to July 2024. In this study, limited trials and field trials were conducted. The limited trial was conducted at SD 7 Klumpit for grade V students with a total of 10 students. While the broad trial was conducted in class V at SD 5 Jurang with a total of 17 students.

This study implemented of the 10 steps of the research and development model as described by Sugiyono (2013) due to limitations by researchers. There are 10 development steps according to Sugiyono (2013), namely: 1) Identification of potential and problems, 2) Data collection, 3) Product design, 4) Design validation, 5) Design revision, 6) Product trial, 7) Product revision, 8) Usage trial, 9) Product revision, and 10) Mass production.

The data collection techniques used were observation, interview, test, and documentation methods. While the research instruments used interview guidelines, validation sheets, teacher and student response questionnaires, learning outcomes tests. Data analysis techniques consist of qualitative data and quantitative data.

2. Methodology

2.1 Research Design

This investigation utilizes qualitative as well as quantitative approaches. Data analysis in this research is performed using quantitative techniques, which include instrument testing and effectiveness assessment. The quantitative data will be sourced from the results of pre-tests and post-tests.

2.2 Respondents of the study

In line with the research stages, several data collection processes will be implemented. This research will feature a limited trial and a field trial. The limited trial will be conducted at SD 7 Klumpit with a total of 10 fifth- grade participants. On the other hand, the extensive trial will take place at SD 5 Jurang with 17 fifth-grade students.

3. Findings and Discussion

Before starting the research, researchers first conducted field observations. This observation was conducted to obtain information related to the learning process and outcomes. It was concluded that the learning approach that had been applied so far was not effective because it still did not maximize textbooks and learning media. And teaching modules still rely on ordinary learning steps to be the main factor that hinders the teaching and learning process.

Efforts to improve student learning outcomes, especially in grade V Natural and Social Sciences subjects are carried out through the development of teaching books based on Problem Based Learning (PBL). In addition, this textbook is also expected to meet additional needs in the learning process and become a relevant reading source for students.

3.1 Textbook Validation

Expert validation is a process carried out to ensure the validity or truth of information provided by an expert. Textbook results are submitted to experts who have expertise in their fields. The selected experts are material experts and media experts.

Table 1. Textbook Validation Results

Validator	Total Score	Score Obtained	Percentage Result	Criteria	Conclusion
Material	20	17	85%	Valid	Feasible but minor revisions should be made
Media	16	14	87%	Valid	Feasible but minor revisions should be made

Based on the results in the table, it is obtained that the results of the assessment of coursebooks by material validators get a score of 17, which results in a percentage of 85%. So that it is included in the category "valid and feasible to use but there are still minor revisions". While the results of the assessment of coursebooks by media validators get a score of 14, which results in a percentage of 87%. So that it is included in the category "valid and feasible to use but there are still minor revisions". Material and media validators also provided several suggestions and comments for further improvement.

IPAS textbooks based on Problem Based Learning (PBL) can be said to be valid because they meet several indicators of feasibility, namely material feasibility and feasibility of graphics according to media experts. With positive validation results, Problem Based Learning (PBL) based textbooks can be used as an effective and useful learning resource for students.

In order to test the Problem Based Learning (PBL) textbook, it has gone through field testing. This field testing consists of two stages, namely limited trials and extensive trials. The two test groups in this study were given learning about chapter 5 material entitled "How We Live and Grow" using IPAS textbooks based on the Problem Based Learning (PBL) learning model.

The limited trial is the first step before conducting a comprehensive trial. In the limited trial group, learning is conducted with the aim of evaluating the effectiveness of the IPAS textbook based on the Problem Based Learning (PBL) learning model used and identifying areas that need to be improved or enhanced. Thus, the results of this pilot test can be used to improve the quality of learning and ensure that the coursebook provided can provide maximum benefits for learners.

The product trial was conducted on a limited basis, involving a teacher and ten students from class V at SD 7 Klumpit as participants. It was carried out in three learning meetings, namely on April 22 to April 2024.

Table 2. Results of Learner Response Questionnaire Sheet on Limited Trial

Percentage	Category
83,1%	Good

Table 2 shows that the results of the questionnaire of students' responses to learning while using textbooks at 83.1%, and included in the "good" category. The effectiveness of learning can be measured by how active students are in the learning process, where student activity reaches a good minimum level as an indicator.

Table 3 shows that the results of the teacher response questionnaire to coursebooks that have been used during learning get a percentage of 85.9% and are included in the "good" category. And stated that the textbook helped them in delivering the subject matter more effectively, motivating students to learn, and providing better understanding to students.

From these results, it can be concluded that coursebooks based on Problem Based Learning (PBL) have effectiveness in improving material understanding, activeness, student learning participation. And also can help teachers in the learning process to students on a limited trial.

This is in accordance with the findings of research studies conducted by Aprilia et al. (2021), (Devirita et al., (2021); Yuristia et al. (2022), that the development of coursebooks based on the Problem Based Learning (PBL) model that they developed has met at least valid, practical and effective criteria and is suitable for use in the learning process ((Sukma et al., 2021)and (Istiqomah et al., 2022).

3.2 Broad Trial Learning Process

A broad trial of the textbook design was conducted at SD 5 Jurang for grade V students as many as 17 students. The extensive trial was carried out with three meetings. The meetings were held on Thursday to Saturday, April 25-27, 2024.

Before the start of the learning process, students will be given a pre-test question as a tool to measure their initial knowledge of the material to be taught. After the meeting ends, a post-test is conducted as an evaluation to see the extent to which students have understood and mastered the material.

The teacher distributes IPAS textbooks based on the Problem Based Learning (PBL) learning model to be used in learning. During the learning process, students are divided into four groups. The learning process involves three main stages, namely initial activities, core activities, and closing.

The implementation of the problem-based learning model includes five stages of Problem Based Learning (PBL), namely: 1) orienting students to authentic problems, 2) organizing students, 3) guiding individual and group investigations, 4) developing and presenting work, 5) analyzing and evaluating the problem- solving process.

3.3 Effectiveness Test Analysis Results

Before conducting the effectiveness test, an instrument test was conducted. The tests used are validity test, reliability test, difficulty level and differentiation.

After carrying out the effectiveness test, the effectiveness test is carried out by comparing the learning outcomes of students from the pre-test and post-test. The tests used are normality test, and mean difference test (t test), N-Gain test. The calculation process uses the SPSS version 26 program.

3.4 Validity Test

Based on the results of the validity test calculation, it shows that of the 20 question items submitted, there are 16 question items whose r-Count results are more than r-Table (>0.514) and Sig (P-value) <0.05, so it concludes that there are 16 question items declared "valid".

While there are as many as 4 question items whose r-Count results are less than r-Table (<0.514) and Sig (P-value)> 0.05, it is concluded that there are 4 question items declared "invalid".

Table 3. Validity Test Results

Statement	r - Count	r – Table (N = 13)	P (sig)	Description
P1	0,789**	0,514	0,001	Valid
P2	0,607*	0,514	0,028	Valid
P3	0,603*	0,514	0,029	Valid
P4	0,362	0,514	0,224	Invalid
P5	0,799**	0,514	0,001	Valid
P6	0,799**	0,514	0,001	Valid
P7	0,799**	0,514	0,001	Valid
P8	0,799**	0,514	0,001	Valid
P9	0,799**	0,514	0,001	Valid
P10	0,401	0,514	0,174	Invalid
P11	0,539	0,514	0,057	Valid

3.5 Reliability Test

Based on the results of the reliability test calculation, the Cronbach's Alpha value is at 0.919 (>0.60), it is concluded that the research instrument is declared "reliable".

Table 4. Reliability Test Results

Cronbach's Alpha	N of items
0.919	20

3.6 Test the Level of Difficulty

Based on the results of calculating the level of difficulty, there are 10 question items that are included in the "easy" criteria (0.71 - 1.00). And there are 10 question items that fall into the "medium" criteria (0.31 - 0.70).

Table 5. Results of the Level of Difficulty Test

Question No.	Mean	Difficulty Level
P01	0,6923	Medium
P02	0,7692	Easy
P03	0,8462	Easy
P04	0,6154	Medium
P05	0,8462	Easy
P06	0,8462	Easy
P07	0,8462	Easy
P08	0,8462	Easy
P09	0,8462	Easy
P10	0,5385	Medium
P11	0,3846	Medium
P12	0,7692	Easy
P13	0,6923	Medium
P14	0,8462	Easy
P15	0,8462	Easy
P16	0,6154	Medium
P17	0,5385	Medium
P18	0,7692	Medium
P19	0,6923	Medium
P20	0,6923	Medium

3.7 Distinguishing Power Test

Based on the results of the differentiation test calculation, there are 10 question items that are included in the "excellent" criteria (0.70 -1.00). There are 8 question items that are included in the "good" criteria (0.40 - 0.69). And there are 2 question items that are included in the "sufficient" criteria (0.20 - 0.39).

Table 6. Differentiated Test Results

Statement	r - Count	Differentiating power
P1	0,789**	Very good
P2	0,60	Good
P3	0,603*	Good
P4	0,362	Simply
P5	0,799**	Very good
P6	0,799**	Very good
P7	0,799**	Very good
P8	0,799**	Very good
P9	0,799**	Very good

3.8 Effectiveness Test Learner Learning Outcomes Normality Test

Since the number of correspondents is less than 50 (<50), the "Saphiro- Wilk" column is used. The normality test results in the Saphiro-Wilk column show that the significance value for the pre-test value is 0.203 (p>0.05), while for the post-test value is 0.461 (p>0.05), so the null hypothesis is accepted. From these results, it can be concluded that the scores from the pre-test and post-test have a normal distribution.

Table 7. Normality Test Results Pre-Test and Post-Test Values

	Statistic	df	Sig.
Pre_test	0.928	17	0.203
Post_test	0.95	17	0.461

3.9 Mean difference test (t-test)

Based on the results of the pre-test with post-test t test, it was found that the significance value (Sig. (2- tailed)) of 0, which is smaller than α = 0.05. So it can be concluded that the null hypothesis (Ho) is rejected and the alternative hypothesis (Hs) is accepted. Which means there is a significant difference between the mean scores of the pretest and post-test.

Table 8. Differential Test Results of Pre-Test and Post-Test Student Learning Outcomes

	Mean	N	Std. Deviation	Std. Error Mean
Pre_test	60,06	17	11,366	2.757
Post_test	78.06	17	9.769	2.369

Table 9. Paired Samples Test

	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
Pre_test - Post_test	-18	11,859	2.876	-24.097	-11,9	-6.26	16	0

3.10 N-Gain Test

N-gain Theresults are at a score of 76.19 (greater than 0.7), in the "high " category, so it is very effective. While the N-gain percent is 7618.78% (greater than 70%), then in the category "already effective".

Table 10. N-Gain Test

	N	Minimum	Maximum	Mean	Std. Deviation
Ngainskor	17	55	93	76.19	9.334
NgainPersen	17	5467	9273	7618.78	933.370
Valid N (listwise)	17				

Based on this, it shows that students who use IPAS textbooks based on Problem Based Learning (PBL) for grade V SD material "Chapter 5 - How We Live and Grow" have a significant increase in learning outcomes compared to before students have not used the textbook. This shows that a learning approach that integrates Problem Based Learning (PBL) can improve the overall understanding and learning outcomes of students.

This is in accordance with the findings of a research study conducted by Kistian (2019) which states that the use of the Problem Based Learning (PBL) model is one of the right ways to improve student learning outcomes. Another thing is, the Problem Based Learning learning model is one of the ideal learning models applied in science learning. The Problem Based Learning (PBL) model also has several advantages, these advantages are explained by Abidin (2014) the advantages of the Problem Based Learning (PBL) model, namely: (1) able to increase students' motivation in learning, (2) encourage students to improve their thinking skills, and (3) learning becomes meaningful so as to encourage students to have high self-confidence and be able to learn independently.

4. Conclusions and Recommendations

The Problem Based Learning (PBL) based textbook is considered valid in the validity classification. Material validation is at a score of 85% (valid), and media validation is at a score of 87% (valid). Based on the results, this textbook gets a valid assessment and is suitable for use.

The results of the pre-test with post-test t test, found a significance value (Sig. (2-tailed)) of 0, which is smaller than α = 0.05. So it can be concluded that the null hypothesis (Ho) is rejected and the alternative hypothesis (Hs) is accepted. Which means there is a significant difference between the mean scores of the pretest and post- test. The N-gain results are at a score of 76.19 (greater than 0.7), in the "high" category, so it is very effective. Meanwhile, the N-gain percent is 7618.78% (greater than 70%), in the "already effective" category. Based on this, it shows that students who use IPAS textbooks based on Problem Based Learning (PBL) for grade V SD material "Chapter 5 - How We Live and Grow" have a significant increase in learning outcomes compared to before students have not used the textbook. This shows that a learning approach that integrates Problem Based Learning (PBL) can improve the overall understanding and learning outcomes of students.

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Conflict of Interest
Authors declare there is no conflict of interest.

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