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DEVELOPMENT OF HOTS-BASED TEACHING MATERIALS TO IMPROVE STUDENTS' *PROBLEM-SOLVING* SKILLS IN ISLAMIC RELIGIOUS SUBJECTS AT SD MUHAMMADIYAH 18 PALEMBANG

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Abstract: *The low use of teaching materials that stimulate higher-order thinking skills, while students at the concrete operational stage according to Piaget already have the potential to be trained in logical and analytical thinking. This study aims to develop HOTS-based teaching materials to improve the problem-solving skills of fourth-grade students at SD Muhammadiyah 18 Palembang. This research uses the Research and Development (R&D) method with the Planning, Production, and Evaluation (PPE) model, involving observations, interviews, questionnaires, and pre-and post-tests to measure the effectiveness of the product. The validation results show that the developed teaching materials fall into the high category in terms of content and design, with consistent reliability testing. The paired sample t-test shows significant improvement in students' problem-solving skills after using HOTS-based teaching materials (t value = -10.791; sig. 0.000), compared to the control group (t value = -3.994; sig. 0.000), and the independent sample t-test strengthens the significant difference between groups (t value = 3.875; sig. 0.000). Thus, the HOTS-based teaching materials are proven to be valid, effective, and can serve as an innovative model in the development of Islamic Religious Education learning in elementary schools.*

Keywords: *Development, Teaching Materials, Problem-Solving Skills, HOTS*

INTRODUCTION

21st century education requires students to have higher order thinking skills (HOTS) as a provision in dealing with real-life complexities.[1] HOTS includes analytical, evaluative, creative, and problem solving skills that are applicable, including for elementary school students who are still in the concrete operational stage according to Piaget's theory. Therefore, the HOTS approach at the elementary level must be adjusted to the stage of children's cognitive

[1] Sri Rahayu and Naif Mastoor Alsulami, "Assessing higher order thinking skills of the 21st century learners using socio-scientific issues as a context", *The 6th International Conference on Mathematics and Science Education (ICoMSE) 2022* 1, no. 1 (2022), https://doi.org/10.1063/5.0214793.

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development so that learning becomes meaningful and according to their thinking capacity.[2] In the context of Islamic Religious Education (PAI), the implementation of HOTS is strengthened by the 2013 Curriculum which encourages students not only to memorize religious texts, but also to analyze the meaning of verses, evaluate the relevance of teachings in social life, and formulate solutions based on Islamic values [3][4]. Thus, HOTS-based PAI learning not only strengthens religious understanding, but also develops critical and reflective thinking skills from an early age to face the challenges of the times.[3]

This research focuses on *problem solving* skills as the main element in the HOTS approach because it is considered the most strategic in forming critical and reflective thinking skills needed in real life, including in understanding and practicing religious values.[4] Compared to other aspects such as analysis, evaluation, or creativity, *problem solving* is considered more relevant in learning Islamic Religious Education (PAI) because Islamic teachings are often contextualized through real social problems.[5] Although HOTS is often associated with the secondary to upper education level, various studies show that *problem-solving skills* can and need to be instilled from basic education, such as through the practice of resolving social conflicts, making decisions based on Islamic teachings, and understanding the wisdom of life events. Because this research is oriented towards the development of teaching materials, the material prepared is not only informative, but also designed as a stimulus that encourages students to think critically, investigate problems, and find solutions.[6] In the context of PAI, HOTS-based teaching materials are a means to internalize religious values through active, reflective, and contextual learning experiences.

In HOTS-based Islamic Religious Education (PAI) learning, *problem solving* skills are the main outcome that unites cognitive aspects with the spiritual and emotional dimensions of students. This approach not only trains analytical and evaluative thinking skills, but also directs

[2] Dwi Kusuma Ainurrosyidah, I Ketut Mahardika, en Iwan Wicaksono, "Analysis of Student Development According to Jean Piaget's Theory and Its Implementation in Junior High School Science Learning", *Edusaintek: Journal of Education, Science and Technology* 11, no. 3 (2024): 1503–19.
[3] Iqbal Faza Ahmad en Ahmad Syafii, "Trends in the Implementation of Higher-Order Thinking Skills in Islamic Religious Education in Madrasahs and Schools : A Systematic Literature Review", *Journal of Islamic Education* 9, no. 2 (2020): 195–216, https://doi.org/10.14421/jpi.2020.92.195-216.
[4] Asri Karolina en Andika Apriansyah, "Implementation of the Independent Learning Curriculum in the Development of Critical Thinking Skills in Islamic Religious Education Learning", *Muaddib : Islamic Education Journal* 6, no. 1 (2023): 35–44.
[5] Rubi Babullah et al., "Collaboration of Group Discussion Method with Problem Solving Learning to Improve Students' Problem-Solving Skills in Aqidah Akhlak Material", *Journal of Islamic Ethics* 2, no. 2 (2024).
[6] Ii Wartini et al., "Application of Problem Solving Methods to Improve Mathematical Understanding", *Al-Aulad: Journal of Islamic Primary Education* 1, no. 2 (2023): 1–9.

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students to integrate religious values in every decision-making, especially when faced with moral and ethical dilemmas.[7] This integration emphasizes that PAI learning is not only aimed at academic achievement, but also at the formation of strong religious character and grounded spiritual principles in the practice of daily life.[8] More than that, the development of HOTS in religious education supports the formation of character as a whole, by fostering the habits of critical thinking, ethical attitudes, and social care, not just the inheritance of normative values. This concept is in line with the character education approach as explained by Ratna Megawangi, who emphasizes the importance of the process *of knowing the good, loving the good, and acting the good* as a way to form noble morals through the integration of cognitive, emotional, and physical aspects.[9] Thus, the application of HOTS in PAI plays an important role in forming an Islamic generation that is not only intellectually intelligent, but also has moral integrity and social sensitivity, ready to face the challenges of global life with Islamic values as the basis of attitudes and actions.[10]

Based on the results of initial observations in grade IV of SD Muhammadiyah 18, it was identified that the learning process is still teacher-centered, with minimal material delivery methods involving students' active participation in problem solving, so that it is contrary to the essence of the HOTS approach. As a result, students do not gain learning experiences that foster critical and independent thinking skills in dealing with problems. The use of teaching materials in PAI learning is also limited, as most of them are only sourced from teacher working group forums without adjustment to the specific needs of students or classes. Initial surveys show that the problem-solving skills of grade IV students are still low, which can be seen from their difficulty in answering HOTS-based questions, indicating a lack of training in high-level thinking. In addition, teachers have not optimally implemented HOTS-based learning strategies, both due to limited competencies and lack of curriculum innovation. This shows that there is still a need to improve the development of teaching materials and strengthen the capacity of teachers to be able to encourage relevant and applicable 21st century skills in the context of PAI learning in elementary schools.

[7] Imam Mashuri en Aspect Cognitive, "Implementation of Problem Solving Method to Improve Students Cognitive Aspects in PAI Subjects at SMP Jati Agung Taman Sidoarjo", *INCARE* 03, No. 06 (2023).
[8] Nur Asyiah Bulqist Rahman, "Analysis of Scientific Learning in Islamic Education", *Didactic : PGSD Scientific Journal FKIP Mandiri University* 09, no. 02 (2023): 1664–72.
[9] Bahar Agus Setiawan, "The Effect of Hots-Based Islamic Education on the Attitude of Religiosity and Its Impact on Improving Students Spirituality", *Proceedings of the International Conference on Community Development* 477, no. 1 (2020): 122–25.
[10] Benedicta Dwi Adventyana et al., "retc", *Journal on Education* 06, no. 02 (2024): 11818–26.

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The urgency of developing HOTS-based teaching materials in SD Muhammadiyah 18 is very high, in line with the encouragement of the Independent Curriculum which gives autonomy to teachers to adjust learning contextually. The lack of active participation of students in the problem-solving process and the limitations of effective teaching materials indicate the need for innovative interventions. HOTS-based teaching materials will not only encourage students to think critically and creatively, but also equip them with problem-solving skills that are applicable in real life. Therefore, this research aims to develop HOTS-based PAI teaching materials in response to academic and practical gaps in Islamic education, as well as an effort to improve students' cognitive readiness to face future challenges.

Based on this background, the purpose of this study is to find out the process of developing HOTS-based Islamic Religious Education (PAI) teaching materials which are designed to improve the problem-solving skills of grade IV elementary school students, produce valid and suitable teaching materials, and test their effectiveness in improving students' problem solving skills in real life in the context of learning.

THEORETICAL STUDIES

The development of Islamic Religious Education (PAI) teaching materials based on HOTS rests on two main foundations: problem-solving theory and teaching material development theory. In the context of the 2013 Curriculum, HOTS has been systematically integrated to foster the ability to analyze, evaluate, and create since elementary school level.[11] Its application in PAI subjects aims to make students not only memorize religious texts, but also be able to relate Islamic teachings to actual social conditions, evaluate their relevance, and formulate solutions based on religious values.[12] This shows that strengthening spiritual character and developing high-level thinking skills can run in parallel. Previous studies also support that the implementation of HOTS in PAI has developed, both in terms of learning processes and innovation of teaching instruments, which directly encourage students to think critically, reflectively, and applicatively in the context of Islam and global life.[13]

[11] Andreas Marougkas et al., "Virtual Reality in Education: A Review of Learning Theories, Approaches and Methodologies for the Last Decade", *Electronics* 12, no. 1 (2023).
[12] Sam Sims et al., "Effective Teacher Professional Development: New Theory and a Meta-Analytic Test", *Review of Educational Research* 95, no. 2 (2025): 213–54, https://doi.org/10.3102/00346543231217480.
[13] Y Empirically Defining en Language Learning, "Empirically Defining Language Learning and Teaching Materials in Use Through Sociomaterial Perspectives", *Queens University Belfast* 105, no. 1 (2021): 3–20.

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Problem-solving theory as explained by Ariyana emphasizes six stages of systematic thinking: identifying problems, exploring, planning solutions, implementing, verifying, and evaluating.[14] These six aspects are the basic framework for designing HOTS-based learning activities that encourage elementary school students to be able to solve problems logically and responsibly. The theory of teaching material development, as stipulated in Permendikbud No. 8 of 2016, states that teaching materials must meet structural and content standards.[15] In the context of HOTS-based PAI, the material is comprehensively prepared through case studies, open-ended questions, and reflective scenarios in order to not only convey knowledge, but also challenge students to think deeper, argue, and find solutions independently.[16] This combination of approaches makes teaching materials an active learning tool that is able to develop problem solving skills and Islamic character simultaneously.

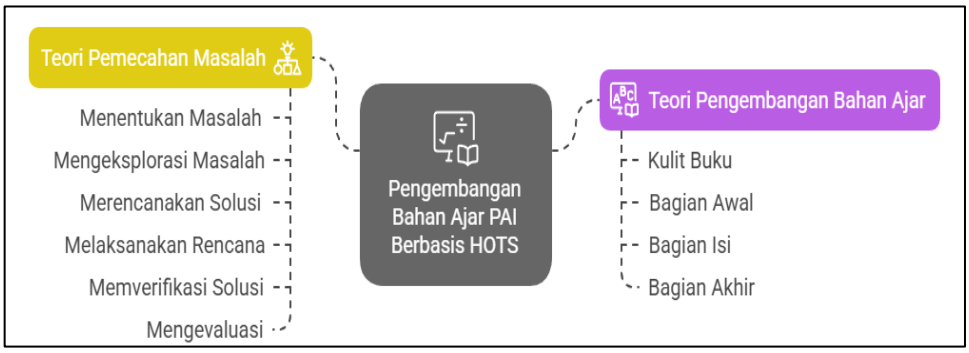

Figure 1. Theoretical Framework Used

RESEARCH METHODS

The research method used in this study is Research and Development (R&D), which is categorized as a *mix-method* method because it combines qualitative and quantitative approaches.[17] The development model adopted is Planning, Production, and Evaluation (PPE) from Richey and Klein, which consists of three stages: planning, production, and evaluation. In the planning stage, the researcher conducts a needs analysis through observation, interviews,

[14] Eyyup Akbulut, "The Relationship Between Communicative Actions , Behavioral Intentions , and Corporate Reputation in the Framework of Situational Theory of Problem Solving in a Public Health Crisis", *International Journal of Public Health* 68, no. 01 (2023): 1–9, https://doi.org/10.3389/ijph.2023.1606301.
[15] Rüdiger Tiemann and Amany Annaggar, "A framework for the theory-driven design of digital learning environments (FDDLEs) using the example of problem-solving in chemistry education", *Interactive Learning Environments* 0, no 0 (2021): 1–14, https://doi.org/10.1080/10494820.2020.1826981.
[16] Muhammad Habib Faturrohman et al., "Indonesian Journal of Teaching and Learning The Ability of Seventh-Grade Students in Mathematical Problem-Solving on Set Theory Using Animation Media", *Indonesian Journal of Teaching and Learning* 3, no. 4 (2024): 241–49.
[17] John W. Creswell and J. David Creswell, *Mixed Methods Procedures*, *Research Defign: Qualitative, Quantitative, and Mixed M ethods Approaches*, 2018.

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and literature studies.[18] The production stage focuses on making HOTS-based Islamic Religious Education (PAI) teaching materials that are tailored to the needs of grade IV students. Evaluation is carried out through validation by material and design experts, as well as limited trials with students to determine the readability and effectiveness of teaching materials in improving problem-solving skills.[19]

Data collection was carried out through structured interviews with teachers and the distribution of questionnaires to students to find out the needs of teaching materials. Product validation is carried out by material experts and design experts using Likert scale-based assessment instruments.[20] The effectiveness test of the teaching materials was carried out through a pseudo-experiment using *a pretest-posttest control group* design, with the research subjects of grade IV students of SD Muhammadiyah 18 selected through *cluster sampling techniques*.[21] Qualitative data analysis uses the Miles and Huberman model, including data reduction, data presentation, and conclusion drawn. Meanwhile, quantitative analysis included tests of the validity and reliability of instruments, normality and homogeneity tests, and effectiveness tests with *paired sample t-test* and *independent sample t-test* to see the difference in learning outcomes between experimental and control groups.[22] All procedures are carried out according to research rules to ensure the validity and accuracy of the data obtained in developing valid, practical, and effective teaching materials.

DISCUSSION

1. Initial Product Development Results (Planning and *Production Stage)*

Based on the results of interviews with PAI teachers in grade IV, it is known that students face various difficulties in understanding Islamic Religious Education materials, especially in the aspects of faith, worship, and morals. Students tend to only memorize without understanding the deep meaning, so they are less able to solve problems that require understanding and reflective thinking. In addition, PAI material is considered monotonous, so it does not attract students' interest in learning. The teacher stated that critical thinking skills

[18] John Creswell, "Qualitative Inqury Research Design Choosing Among Five Approaches", 2017.
[19] Rizka Marliana, Sukarno Sukarno, en Siti Wahyuningsih, "The Use of Pop Up Book Media in Pancasila Education Learning Material on the Meaning of Pancasila Precept Symbols in Grade 4 Students in Elementary Schools", *Dwight Dwight Dwight* 11, no. 2 (2023), https://doi.org/10.20961/ddi.v11i2.76024.
[20] Prof. DR. Sugiyono, *Sugiyono's book, a qualitative quantitative research method*, *Brazilian Journal of Applied Linguistics*, vol 5, 2019.
[21] Suggestion, *Quantitative Research Methods* (Bandung: Alfabeta, 2018).
[22] Suggestion, *Quantitative, Qualitative, R&D Research Methods* (Bandung: Alfabeta, 2021).

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are very important so that students can connect religious teachings with real life and be able to make decisions that are in accordance with Islamic values. However, the application of HOTS-based questions is still limited, and the implementation of the HOTS concept in daily teaching has not been running optimally due to the limitations of guides and teaching materials.

Teachers also said that learning activities that encourage analytical and creative thinking have been carried out through discussion or comparison of religious values with daily behavior, but are often constrained by the lack of appropriate teaching materials. The teaching materials used so far come from standard textbooks and additional materials such as videos, which have not supported the development of high-level thinking skills. The evaluation of problem-solving skills is also not optimal because the questions used are still simple and teachers have difficulty compiling HOTS questions and limited time to provide feedback. The teacher emphasized the importance of developing HOTS-based PAI teaching materials that present real context, case studies, and reflective activities that can train students to think critically, creatively, and solutively in dealing with religious problems in daily life.

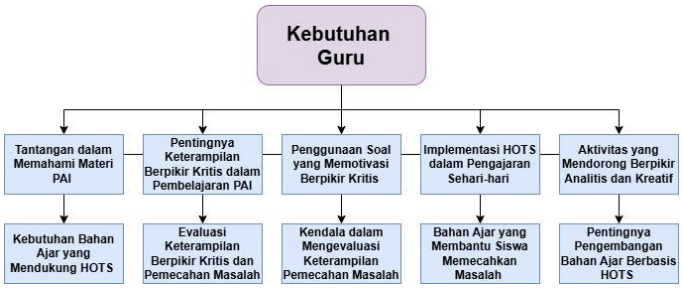

Figure 2. Teacher Needs Concept Map

Based on the results of a questionnaire on students' needs for Islamic Religious Education (PAI) teaching materials based on Higher Order Thinking Skills (HOTS), it was identified that the majority of students, both male and female, showed a positive tendency towards the development of teaching materials that support critical thinking, analytical, and problem-solving skills. In the first to fifth statements, students strongly support the importance of teaching materials that are able to encourage them to think deeply and be relevant to their daily lives. This can be seen from the high percentage of "Strongly Agree" and "Agree" responses, especially in the aspects of learning relevance, spiritual reflection, and the need for more applicable analysis and evaluation exercises. These findings show that students not only need theoretical understanding in PAI lessons, but also want to be actively involved through activities that invite them to think and act contextually.

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In the sixth to tenth statements, students showed high enthusiasm for teaching materials that helped them apply religious concepts to solve problems, both individually and through group work. Support for interactive, dialogical, and collaboration-based teaching materials is also reflected in a strong response to aspects of learning motivation and the desire to think systematically. Interestingly, female students showed a slightly higher percentage of support in most indicators, especially in terms of relevance and utilization of HOTS-based teaching materials. Overall, the results of this questionnaire affirm the importance of developing PAI teaching materials that are able to stimulate high-level thinking skills from an early age, as a provision to face real problems in their social and spiritual lives.

Table 1. Total Score Results of Each Statement

Yes	Statement	Total Statement Score	Percentage (%)
1	X1	123	84,82759
2	X2	110	82,06897
3	X3	127	87,58621
4	X4	112	77,24138
5	X5	122	84,13793
6	X6	121	83,44828
7	X7	125	86,2069
8	X8	128	88,27586
9	X9	123	84,82759
10	X10	113	77,93103
Average			83,65517241

The average results quantitatively showed that 83.65% of students supported the development of HOTS-based teaching materials, which indicates that there is great potential to design learning materials that are able to improve critical thinking skills according to the needs and expectations of students.

At the production stage, researchers began to develop teaching material products in the form of textbooks after knowing the needs of teachers and students. This process takes place from December 4 to 11, 2025, by compiling important components of the book such as the cover page, introduction, table of contents, initial competencies, learning objectives, introduction, instructions for use, and six main chapters that include PAI material such as verses of the Qur'an, Asmaul Husna, faith, morals, worship, and the story of the prophet's example. Each chapter is equipped with an opening illustration, HOTS-based learning objectives (C4–C6), teaching materials, student activities, and summaries. The main emphasis in the

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preparation of this textbook is on the integration of HOTS principles and problem-solving theory so that students can think critically, reflectively, and be able to work together in solving relevant problems and case studies.

Figure 3. Front Page Cover

All components are designed with an attractive visual appearance, such as the use of green colors, Muslim children's animations, and communicative designs to suit the characteristics of elementary school age children. In addition, the researcher compiled instructions for the use of teaching materials for teachers, which contain systematic steps in implementing this book in the classroom. This textbook not only presents contextual and applicable teaching materials, but also includes student activity sheets designed to stimulate collaborative problem-solving. At the end of the book, the researcher adds a bibliography as a form of academic accountability for all material content, making this product not only interesting and interactive, but also valid from a scientific point of view.

2. Product Trial Results (Evaluation Stage)

The initial design of the teaching materials that had been prepared was then validated by Dr. Hartatiana, M.Pd., an educational design expert from UIN Raden Fatah on December 12, 2024. Based on the results of the design assessment questionnaire, the total score obtained was 52 out of 70, which showed a feasibility percentage of 74.29% and was categorized in the "High" level. However, despite this, validators rated the product as "Suitable for Use After Repairs." Suggestions for improvement include the importance of adapting the design to the characteristics of the students as well as the addition of supporting illustrations to clarify difficult material. Thus, this evaluation is an important reference to revise the visual and structural aspects to better suit the needs of grade IV elementary school students.

The material validation was carried out by Dr. Asri Karolina, M.Pd.I., an expert in the field of Islamic Religious Education, on December 16, 2024. Based on the results of the

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questionnaire, the score obtained was 74 out of 95, with a percentage of 77.90%, which is included in the "High" eligibility category. The validator concluded that the teaching materials were "Suitable for Use After Improvement," and provided two main suggestions: ensuring the accuracy of the material references and correcting the instructions for use to match the available content. These findings show that in substance, the teaching materials have met the HOTS criteria and the relevance of PAI, but still need to be refined in technical and supporting aspects so that they can be used optimally in the elementary school environment.

3. Product Revision (Evaluation Stage)

At the evaluation stage, the researcher revises the design and product materials based on input from the validator. The design revision includes two main points, namely adapting the teaching materials to the characteristics of grade IV students and adding supporting illustrations that make it easier to understand concepts, such as tajweed images and long text illustrations. This change aims to increase students' visualization power and clarify the delivery of material. Meanwhile, in the material aspect, the researcher revised two important things according to the validator's suggestion: ensuring that all references cited come from credible sources such as accredited journals and scientific books, and improving learning objectives to match the HOTS indicators (C4, C5, and C6). This adjustment ensures that the textbook is not only valid in terms of content, but also able to encourage the development of high-level thinking skills, particularly in students' problem-solving abilities.

4. Final Product Review (Evaluation Level)

a. Normality Test

Table 2. Normality Test Results

Category		Kolmogorov-Smirnova		
		Statistics	**Df**	**Sig.**
Result	*Pre Test* Control	.123	28	.200*
	Post Test Control	.107	28	.200*
	Pre test experiment	.139	29	.163
	Post Test Experiment	.119	29	.200*
*. This is a lower bound of the true significance.				
a. Lilliefors Significance Correction				

The normality test in this study used the Kolmogorov-Smirnov method and showed that all data, both in the control and experimental groups, had a significance value above 0.05. This indicates that the data is normally distributed, thus meeting the assumptions for use in parametric statistical analysis for advanced hypothesis testing.

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b. Prerequisite Test (Homogeneity Test)

Table 3. Homogeneity Test Results in Pre-Test

		Living Statistic	**df 1**	**df2**	**Sig.**
Control Class Pre Test and Experiment Class	*Based on Mean*	.117	1	55	.733
	Based on Median	.085	1	55	.771
	Based on Median and with adjusted df	.085	1	51.910	.772
	Based on trimmed mean	.166	1	55	.685

The results of the Levene test showed that all significance values, whether based on the mean, median, or trimmed mean, were above 0.05, indicating that there was no significant difference in variance between the control and experimental groups in the Pre-Test. Thus, the data meets the assumption of homogeneity of variance and can be further analyzed using parametric statistical tests.

Table 4. Homogeneity Test Results in Post-Test

		Living Statistic	**df 1**	**df2**	**Sig.**
Post Test Control Class and Experimental Class	*Based on Mean*	2.375	1	55	.129
	Based on Median	1.719	1	55	.195
	Based on Median and with adjusted df	1.719	1	53.324	.195
	Based on trimmed mean	1.961	1	55	.167

Based on the results of the Levene test on the post-test data, all significance values based on the mean, median, and trimmed mean were greater than 0.05, which means that there was no significant difference in variance between the control and experimental groups. This shows that the homogeneity assumption of variance is met, so that the data can be further analyzed using parametric statistical tests.

c. Pre-Test and Post-Test Results in Control Class and Experimental Class

The implementation of pre-test and post-test in this study was carried out systematically in two different classes, namely class IV A as an experimental class and IV B as a control class at SD Muhammadiyah 18 Palembang. The pre-test will be held on January 6, 2025 to measure

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students' initial abilities. Furthermore, the experimental class received intervention through HOTS-based learning with the Problem-Based Learning method, discussion, and inquiry/discovery learning which was divided into three chapters: selected verses of the Qur'an, Asmaul Husna, and faith in the books of Allah. Each learning session was designed to encourage students to think critically and apply religious values in real-life contexts, while the control class continued to use conventional methods without HOTS teaching materials.

The post-test will be carried out on January 25, 2025 to assess the improvement of students' problem-solving skills. Based on the data of pre-test and post-test scores obtained from both classes, there was a difference in the total score indicating a significant increase in the experimental class compared to the control class. Before further analysis was carried out, the data had passed a normality and homogeneity test that showed the fulfillment of parametric assumptions, so it was valid to proceed to the *independent sample t-test* to test the effectiveness of the HOTS-based teaching materials in improving students' problem-solving skills.

Table 5. Descriptive Statistics

	N	***Min***	***Max***	***Mean***	***Std. Deviation***
Pre Experiment	28	5	9	6.39	1.031
Post Experiment	28	7	10	8.46	1.105
Pre Control	29	4	9	6.48	1.326
Post Control	29	5	10	7.17	1.391
Valid N (listwise)	28				

Based on Table 5, it can be seen that both the experimental and control classes experienced an increase in scores from Pre-Test to Post-Test, but the increase that occurred in the experimental class was more significant. The total value of the experimental class increased from 179 to 237, while the control class from 188 to 208. Descriptive data further showed that the average score of the experimental class rose from 6.39 to 8.46, while the control class increased from 6.48 to 7.17. Although both groups showed progress, the higher difference in the experimental class showed the potential effectiveness of HOTS-based teaching materials, which then needed to be further proven through statistical tests such as *independent sample t-tests* and *paired sample tests* to ascertain the significance of the difference.

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Table 6. Paired Sample Test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	PRE_EKS - POST_EKS	-2.071	1.016	.192	-2.465	-1.678	-10.791	27	.000
Pair 2	PRE_KONTROL - POST_KONTROL	-.690	.930	.173	-1.043	-.336	-3.994	28	.000

The results *of the Paired Samples Test* in this study showed that there was a significant difference between Pre-Test and Post-Test scores in both classes, with a much greater increase occurring in the experimental class using a Higher Order Thinking Skills (HOTS)-based textbook. In the experimental class, an increase in the average score of 2.071 with a significance value of 0.000 indicates that the use of HOTS-based teaching materials is effective in improving students' *problem-solving* skills . Meanwhile, the control class that did not use the HOTS-based textbook also experienced an increase, but only by 0.690 with the same level of significance, indicating an increase that was not as strong as the experimental class. These overall findings strengthen the conclusion that HOTS-based teaching materials play an important role in encouraging mastery of high-level thinking skills in Islamic Religious Education subjects. Furthermore, the analysis of *the independent sample t-test* was carried out to test the significance of the differences between the two groups in more depth.

Table 7. Independent Sample Test

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Hasil	Equal variances assumed	1.001	.321	3.875	55	.000	1.292	.333	.624	1.960
	Equal variances not assumed			3.890	53.063	.000	1.292	.332	.626	1.958

Based on the results *of Levene's Test for Equality of Variances*, a significance value of 0.321 (> 0.05) indicates that the variance between the control and experimental classes is homogeneous, so the *t-test* can be continued assuming the similarity of variance. The results of *the t-test for Equality of Means* showed a significance value of 0.000 (< 0.05), which means that there was a significant difference between the Post-Test scores of the experimental class

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students and the control class. The average score difference of 1.292 with a confidence interval range between 0.624 to 1.960 strengthens the evidence that the use of teaching materials based on *Higher Order Thinking Skills* (HOTS) has a positive impact on improving learning outcomes, especially in students' problem-solving skills.

Theoretically, the results of this study strengthen the validity of the use of the HOTS approach which refers to Bloom's taxonomy, which emphasizes the importance of analysis, evaluation, and synthesis skills in the learning process. The textbooks developed have been designed to integrate these principles using a problem-based learning and HOTS-based evaluation approach.[23] It is also consistent with Anderson and Krathwohl's views in Bloom's revision of taxonomy, as well as in line with Vygotsky's constructivist theory of *proximal developmental zones* (ZPDs), which emphasize the importance of teacher guidance in helping students develop the potential for critical and reflective thinking.[24] HOTS-based textbooks provide space for students to explore solutions to real problems independently, while still receiving structured direction from teachers.

These findings also support Piaget's theory of cognitive development, which states that elementary school-aged students are at a concrete operational stage, where they begin to be able to understand cause-and-effect relationships and think logically about abstract concepts. HOTS-based teaching materials are very suitable for this stage of development because they are able to stimulate deeper information processing.[25] The problem-based learning (PBL) approach that is the basis of the textbook design in this study has been proven to be effective in improving students' high-level thinking skills, as stated by Barrows. Therefore, the results of this study not only show the effectiveness of learning instruments, but also provide important implications that the integration of HOTS in the elementary school curriculum needs to be made a top priority to create graduates who are adaptive, solution-ready, and ready to face future challenges.

[23] N. Euis Kartini et al., "A Revision Study of the Cognitive Domain Theory of the Bloom Taxonomy and Its Relevance in the Islamic Religious Education Curriculum", *Basicedu Journal* 6, no. 4 (2022): 7292–7302, https://doi.org/10.31004/basicedu.v6i4.3478.
[24] Euis Nurhidayati, "Constructivist Pedagogy in Indonesian Education Praxis", *Indonesian Journal of Educational Counseling* 1, no. 1 (2017): 1–14, https://doi.org/10.30653/001.201711.2.
[25] Handika, Teti Zubaidah, en Ramdhan Witarsa, "Analysis of Jean Piaget's Theory of Cognitive Development and Its Implications in Mathematics Learning in Elementary School", *Didactic: Journal of Education and Science* 22, no. 2 (2022): 124, https://doi.org/10.30651/didaktis.v22i2.11685.

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5. Research Limitations

This research has several limitations that need to be considered for future development, including the scope of the sample which is limited only to grade IV students at SD Muhammadiyah 18 Palembang, so the results cannot be generalized to the context of other schools; the short duration of the research so that it has not been possible to measure the long-term impact of the use of HOTS-based textbooks; as well as the existence of external factors such as teachers' teaching styles, home environment, and student motivation that cannot be completely controlled. In addition, the measurement of learning outcomes only uses Pre-Test and Post-Test, which do not fully reflect students' cognitive development. Therefore, follow-up research is recommended to expand the scope of the sample, extend the intervention time, and use more diverse evaluation methods so that the effectiveness of HOTS-based teaching materials can be measured more comprehensively.

CONCLUSION

Based on the results of research and development of a textbook based on Higher Order Thinking Skills (HOTS) designed for fourth grade students of SD Muhammadiyah 18 Palembang using the PPE model, it was successfully developed by containing material on faith, worship, morals, and Islamic history. Validation of the content and design of the book showed high results, and the effectiveness test through paired sample t-test and independent sample t-test showed a significant increase in problem solving skills in students who used HOTS-based textbooks compared to conventional learning. This shows that the book is effective in supporting learning based on high-level thinking skills, and can be an alternative learning media that is relevant to the independent curriculum.

To maximize the use of teachers' products, it is recommended to use this book with active learning strategies such as PBL and discussions, while the school is expected to support the implementation with teacher training and integration into the curriculum. In the future, product dissemination can be carried out through seminars, publications, and digital platforms so that the range of use is wider. Periodic evaluation and further development, such as digital formats or for other subjects, also need to be carried out to expand the benefits and strengthen the contribution of this book in improving the quality of education and critical thinking skills of students.

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