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Effect of STEM-PJBL-Based Science Student Book Integrated with Religious Values on Spiritual Attitudes and Science Literacy

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Abstract: This study aims to determine the effect of science student books on the material of Light and Optical Instruments integrated with religious values with the STEM PjBL model approach in improving students' spiritual attitudes and scientific literacy. The study used a quasi-experimental quantitative research method with one group pretest-posttest design. Data collection methods using multiple choice tests and questionnaires. The subjects in this study were 31 students of class VIII C MTs Wahid Hasyim Balung Jember. The results showed that the average N-Gain value of spiritual attitudes was 0.46 with the "Moderate" category. While in the scientific literacy variable, the average N-Gain value of 0.61 was also included in the "Moderate" category. So it can be stated that science student books integrated with religious values based on STEM PjBL can improve students' spiritual attitudes and scientific literacy.

Keywords: Integration of religious values; Science literacy; Science student books; STEM PjBL; Spiritual attitude

Introduction

IPA/NoS (Natural of Science) is a process of discovery about nature that is carried out systematically (Susilawati et al., 2020). Science learning is a form of knowledge that has special characteristics, namely focusing on understanding scientific phenomena and being connected to cause-effect relationships in the learning process (Gulo, 2022). Science learning aims to develop students' understanding of natural phenomena, scientific concepts, scientific methods, and the interaction between society, science, and technology (Pratiwi et al., 2019; Wahyuni, 2022), with the help of science education, students have a wide space to understand science in everyday life. So that students can solve problems and contribute to society. Science learning has an urgency to foster students' understanding of Science and Technology (IPTEK), because through science learning educators can develop thinking skills. Moreover, the implementation of good science education has been proven to produce new discoveries in the field of technology developed by developed countries (Ramdani et al., 2020). In the implementation of modern era learning, educators have an obligation to transform learning according to the skills needed in the 21st century, both in terms of curriculum and learning process (Mardhiyah et al., 2021).

21st century learning requires a learning process that emphasizes understanding scientific concepts and the ability to utilize technology to access, assess and contribute. More precisely, the ability to utilize this technology leads to scientific literacy (Yuliati, 2017). Scientific literacy can be said to be one of the skills that must be possessed in the 21st century. Scientific literacy is included in the list of 16 skills identified by World

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Economic Forum (2015) as essential to face the challenges of the times. Scientific literacy is important to provide understanding to be literate about environmental, economic, social, health and technological topics. So it is important to measure students' scientific literacy in order to improve the quality of education in Indonesia (Afina et al., 2021; Rosidi, 2021).

Indonesia's ranking in 2018 in terms of scientific literacy was 74th out of 79 participating countries. This shows that Indonesia is ranked among the 10 lowest countries in scientific literacy. This is supported by several facts, namely a sample study on scientific literacy in several junior high schools in Yogyakarta showed that scientific literacy data was in the low category, especially in terms of competency in scientific literacy. One of the reasons behind the low scientific literacy of students is that several schools are not yet accustomed to implementing learning based on scientific literacy so that their students are not yet trained to solve problems oriented towards scientific literacy (Widowati et al., 2019).

One of the learning models that can be used to improve science literacy is STEM PjBL-based learning. The STEM (Science, Technology, Engineering, and Mathematics) approach is a method in teaching and learning that includes skills in science, technology, engineering, and mathematics that support interdisciplinary learning and cover all levels of education (Gonzalez & Kuenzi, 2013). STEM can also be interpreted as a learning approach that uses an interdisciplinary approach in its application (Kaniawati et al., 2015). Learning with a simple STEM approach by relating material to scientific phenomena in life and encouraging students to always be actively involved in practice (Pangesti & Yulianti, 2017). So that the STEM approach is closely related to the PjBL (Project Based Learning) model or learning that has output in the form of projects in learning. The PjBL model is a learning model that contains project assignments that actively involve students (Rauziani et al., 2016).

Science learning using the PjBL STEM model approach allows students to solve problems scientifically, so that students gain learning experiences that can increase their scientific literacy (Satriana, 2021).

In terms of spiritual attitudes, students today are in a very worrying condition, this is based on the erosion of students' faith in Allah and the erosion of moral values in students. The Programme for International Student Assessment (PISA) 2018 presented the results of its very surprising research, namely the fact that 41.1% of students in Indonesia experience bullying in the school environment, placing Indonesia in the fifth highest position out of 78 countries experiencing bullying. In 2018, KPAI also reported that 84% of students experienced violence in the school environment. Meanwhile, the National Narcotics Agency (BNN) also reported that there were 2.3 million students in Indonesia who consumed drugs (Alfiyah, 2022). This fact is very surprising, because the country of Indonesia is predominantly Muslim. However, its young generation is actually falling into the abyss of sin.

So one of the efforts that can be done to deal with the decline in the spiritual attitude of students is to teach moral education and increase faith in Allah by including religious value content into school subjects, one of which is in the form of science teaching materials that are integrated with religious values. This fact is supported by research (Syarimansyah et al., 2020) In developing integrated teaching materials, religious values in the form of verses from the Koran can improve spiritual attitudes, especially in the aspect of divinity. Thoyib (2013) defines science material as a tool to understand natural phenomena and is used to enrich or deepen people's knowledge so that they believe in Allah as God the Creator.

Purwanto (2018) explains that more than 800 verses in the Qur'an mention natural phenomena and most of them are commands to study and reflect on these natural phenomena. Hapiz et al. (2019) added that science material should have a big impact on students to get closer to God and improve their attitudes towards others. So this is the basis that science material should be integrated with religious values. The instillation of religious values according to Alim (2011) is the process of inserting religious values or divine values into a person's heart and mind, so that it is reflected in life will always be in accordance with the guidance of the religion that is embraced. So this study was conducted with the aim of determining the effect of teaching materials on science material integrated with religious values based on STEM PjBL in improving science literacy and students' spiritual attitudes.

Method

The research method in this study is a quantitative quasi-experimental method with a one group pretest-posttest design. The subjects in this study were 31 students of class VIII A MTs Wahid Hasyim Balung Jember. Learning was carried out using student books on Light and Optical Instruments material integrated with religious values based on STEM PjBL. This study was conducted to determine students' scientific literacy and spiritual attitudes.

The data produced is quantitative data obtained from pretest posttest questions to measure scientific literacy and spiritual attitudes. The data is then analyzed using the equation from (Hake, 1999).

$$\text{Gain (g)} = \frac{skor\ posttest - skor\ pretest}{skor\ maksimum - skor\ pretest} \quad (1)$$

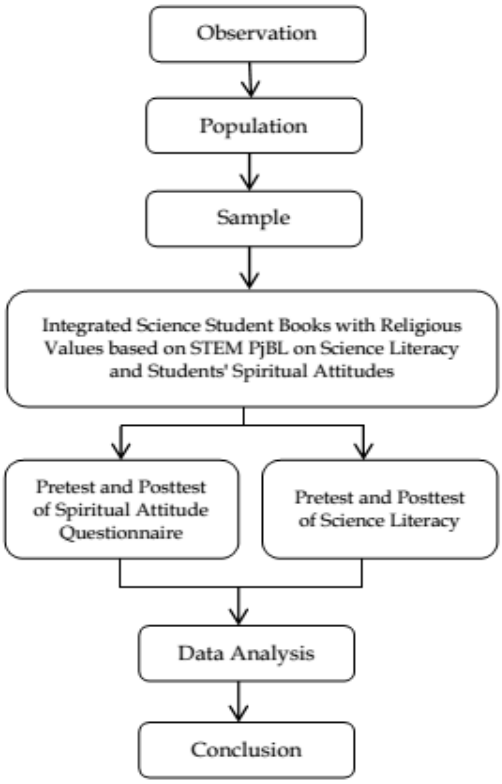

Figure 1. Research flow

This study used a data collection technique in the form of a test. Pretest posttest 25 multiple choice questions of scientific literacy and pretest posttest questionnaire of spiritual attitudes as many as 20 statements. Before giving the pretest and posttest questions, the researcher first conducted a validity, reliability, level of difficulty and discrimination test of the questions on the scientific literacy question instrument, the test results are presented in table 1. While on the spiritual attitude instrument only validity and reliability tests were carried out, the test results are presented in table 2.

Table 1. Validity, Realibility, Difficulty Level, and Distinguishing Power Test of Science Literacy

Test Type	Status	Summary of item estimate	Number of Questions
Validity	Valid		25
	Invalid		0
Reliability		0.970	25
Difficulty Level	Difficult		6
	Medium		13
	Easy		6
Distinguishing Power	Very Good		7
	Good		9
	Quite		9
	Bad		0

Table 2. Validity and Realibility of Spiritual Attitude Questionnaire

Test Type	Status	Cronbach's Alpha	Number of Questions
Validity	Valid		25
	Invalid		0
Reliability		0.905	25

This Student Book of Integrated Science Learning with Religious Values Based on STEM PjBL is compiled in accordance with the format of the Kemendikbudristek teaching materials which include: (1) the first part contains the cover; foreword; list (contents, images, tables); learning achievements and objectives; STEM PjBL approach, book usage instructions; concept map; (2) the content section containing the introduction, material description; project; formative test; and (3) the last section containing the bibliography; index; glossary; and author information. Details can be seen in Table 3.

Table 3. Characteristics of Student Book Products

Format	Content
First Part	Cover
	Foreword
	List (contents, images, tables)
	learning outcomes and learning objectives
	STEM model PjBL approach
	Instructions for using the book
	Concept maps
Core Part	Introduction (integrated apperception of religious values)
	Description of the material (light and optical instruments integrated with religious values)
	Project (integrated PjBL model with religious values)
	formative test
Last Part	Bibliography, index, glossary, author information

The use of the PjBL learning model and the STEM approach begins in the content section of the book which contains a description of the material using the PjBL learning flow, the PjBL model flow starts from formulating basic questions, compiling a project plan, compiling a project timeline, implementing the project & monitoring project progress, testing results & presentations, and evaluating. The integration of religious values in this student book is included in: (1) the content section in the preliminary apperception; (2) description of light and optical instrument material; and (3) the initial steps in formulating basic questions in the PjBL model.

Result and Discussion

The teaching materials used in this study were student books on Light and Optical Instruments

material developed by integrating religious values based on the STEM approach of the PjBL model. The student books that were developed have gone through validation and revision stages, so they are suitable for use in classroom learning.

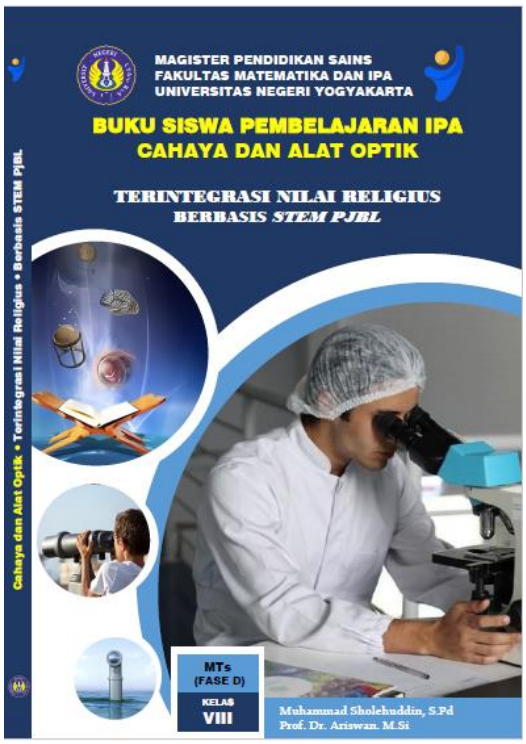

Figure 2. Student books display

In terms of presentation, this student book has been adjusted to the STEM PjBL syntax. The STEM-PjBL syntax used is to determine basic questions; prepare a design plan; prepare a project work schedule; implement projects and monitoring; test results; and evaluate project results. The integration of religious values in this student book has been included in the apperception at the beginning of learning and in working on project assignments.

Students' spiritual attitudes were measured using a spiritual attitude questionnaire containing 20 statements developed from 3 indicators of spiritual attitudes. The indicators of spiritual attitudes are God Oriented (spirituality oriented towards God), World Oriented (spirituality oriented towards nature), and humanistic spirituality.

Table 4 presents the spiritual attitude questionnaire grid that will be used as a guide in compiling questions in the form of statements. The spiritual attitude questionnaire that has been compiled will be distributed to students before and after learning using the science student book integrated with religious values based on STEM PjBL. The results of the pretest and posttest of the spiritual attitude questionnaire were analyzed to obtain the N-Gain value for each indicator. The results of the analysis of the students' spiritual attitude questionnaire using the science student book integrated with religious values based on STEM PjBL can be seen in table 5.

Table 4. Spiritual Attitude Questionnaire Grid

Indicator	Aspect	Item Number
God Oriented Spirituality	Pray when doing something	1, 3
	Thank God for the creation of the universe	2, 4
	The urgency of studying science in increasing faith and devotion to Allah	5, 7, 8, 12
World Oriented Spirituality	Keep the environment clean	6, 9, 15
	Preserving nature	10, 20
Spiritualistic Humanistic	Work together actively in the school environment or outside of school	13, 17, 19
	Like helping others in need	14, 16
	Using polite language when communicating with others	11, 18

Table 5. Pretest and Posttest Result of Spiritual Attitude

Aspect	Pretest	Posttest	Gain
God Oriented Spirituality	76.31	86.49	0.43
World Oriented Spirituality	65.48	80.97	0.45
Spiritualistic Humanistic	66.94	83.76	0.51

The results of the analysis of students' spiritual attitudes showed N-Gain in each aspect. In the god-oriented spirituality aspect, it was 0.43; world-oriented spirituality was 0.45; and spiritualistic humanistic was 0.51. So the average N-Gain of spiritual attitudes was 0.46. These results are in line with research conducted by (Bahtiar & Muhammad, 2024) that the development of e-books containing the values of the Quran or religious values can improve students' spiritual attitudes. For the criteria for increasing N-Gain, the following table 5 is presented:

Table 6. Criteria for Increasing N-Gain

Limitation	Category
$G \geq 0.70$	High
$0.30 \leq g < 0.70$	Medium
$G < 0.30$	Low

Based on table 6, the average result of N-Gain spiritual attitude of 0.46 is in the "Medium" category. So it can be assessed that the science student book on Light and Optical Instruments material integrated with religious values based on STEM PjBL is able to improve students' spiritual attitudes.

As for the students' scientific literacy, the test used was 25 multiple-choice questions. The questions were developed from several aspects, namely: explaining phenomena scientifically; evaluating data and designing scientific investigations; and interpreting data and

evidence scientifically. The results of the pretest and posttest of students' scientific literacy are shown in table 7.

Table 7. Pretest and Posttest Result of Scientific Literacy

Aspect	Pretest	Posttest	Gain
Explain phenomena scientifically	68.33	81.52	0.42
Evaluate data and design scientific investigations	60.08	82.66	0.57
Interpret data and evidence scientific	53.03	93.01	0.85

Table 7 explains that students' scientific literacy shows an N-Gain value in each aspect, in the aspect of explaining phenomena scientifically getting 0.42; in the aspect of evaluating and designing investigations getting 0.57; and in the aspect of interpreting data and evidence scientifically getting 0.85. So the average N-Gain of scientific literacy is 0.61.

Referring to the N-Gain improvement criteria in table 3, the average N-Gain result of 0.61 is in the "Moderate" category. Thus, the science student book on Light and Optical Instruments material integrated with religious values based on STEM PjBL is able to improve students' scientific literacy.

This is supported by research Silfiyani et al. (2024) shows the results of the t-test with the conclusion that the average scientific literacy of students differs significantly between the control class and the experimental class. This is relevant to the research (Sulistina et al., 2024; Dianti et al., 2023; Maghfiroh et al., 2024) which shows that learning with the STEM PjBL approach has a very positive influence on students' scientific literacy.

Conclusion

Science student books on Light and Optical Instruments material integrated with religious values based on STEM PjBL are able to improve students' scientific literacy and spiritual attitudes. In each spiritual attitude indicator, the average N-Gain is 0.46 in the "Moderate" category. While in the science literacy variable, the average N-Gain is 0.61, also in the "Moderate" category. So it can be concluded that science student books integrated with religious values based on STEM PjBL can improve students' spiritual attitudes and scientific literacy. The practical implications of this student book can be an option for science teaching materials integrated with religious values based on STEM PjBL that can be used by schools as a variation of teaching materials to support learning. Meanwhile, the implications for teachers can be a description of the integration of religious values in one of the science materials, namely light and optical instruments, which are combined with a project-based STEM (PjBL) approach.

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Author Contributions
M. S: designing the product, revising the product, designing the research concept, conducting the research, analyzing the research data and writing the article. While A; I. W: validating and evaluating the instrument and product.

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Conflicts of Interest
Researchers say there is no problem.

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