Implementation of the project-based learning model in Merdeka curriculum at secondary school in Indonesia: perceptions of science and religion teachers

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Abstract: To improve the quality of education and strengthen national insight, Indonesia is implementing a National Curriculum called the Merdeka Curriculum, which carries the concept of the Pancasila student profile and must be implemented using a project-based learning model. This research attempts to describe the implementation of the independent curriculum project-based learning model at secondary schools in Indonesia from the perspective of science teachers and Islamic religious teachers. This research uses a qualitative approach with a case study method design. This research data was collected through semi-structured interview techniques involving science teachers and Islamic Religious Education teachers. There were 40 teachers engaged in the research who came from state and private schools, both religious and public. Data was collected through interviews, while data analysis was carried out using qualitative descriptive techniques. The results of this study provide information that according to the perception of science teachers and Islamic religious education teachers, the independent curriculum project-based learning model is difficult to apply at the secondary school education level. According to teachers, the difficulty in implementing this learning is caused by several things, namely: the density of the student population in the class is relatively high, the number of subjects in the curriculum is too large, the assessment of student work (projects) is less accurate, project-based learning management is relatively tricky (the time required too many). It was also found that implementing the PjBL model has yet to effectively improve the program to strengthen national insight as the main objective of the Merdeka curriculum.

Keywords: Project-Based Learning (PjBL); Merdeka Curriculum; Secondary School; Perceptions of Science and Religion Teachers

INTRODUCTION

To improve the quality of education and increase national insight through the program to strengthen the Pancasila Student Profile (PPP), the Indonesian government, through the Ministry of Education, ordered the implementation of the Merdeka curriculum at all levels. The curriculum is implemented using the primary approach (recommended by the government and experts in Indonesia), namely the Project Base Learning (PjBL) model. Empirically, the PjBL learning model is a learning approach that has been proven to have a positive impact on mastery of concepts or improving learning outcomes (Iryanto, 2021), creative thinking abilities (Arisanti et al., 2017), critical thinking abilities (Puspitasari & Wulandari, 2022), metacognition abilities, cooperation abilities, increasing students' active learning (Anggraini & Wulandari, 2021) and problem-solving abilities, growing computing abilities (Shin et al., 2021) and developing 21st-century skills (Markula & Aksela, 2022).

Theoretically, PjBL learning is implemented in groups or what is known as cooperative learning. Group learning design has been proven to positively affect students' motivation and competence (Israil, 2019) and student learning outcomes or achievements (Turgut & Turgut, 2018). In particular, PjBL learning carried out in groups has the potential to increase social interaction between students (Markula & Aksela, 2022). Social interaction between students at school can create harmony, peace, and mutual tolerance (Suganda et al., 2019) and develop social skills (Styla & Michalopoulou, 2016). In Indonesia, social interactions and attitudes of tolerance between students are significant in increasing attitudes of tolerance, unity, and national integrity amidst high ethnic, cultural, linguistic, and religious diversity.

COMMON GROUND

Social interaction and tolerance between students at PjBL are intended to develop the Pancasila Student Profile (PPP) as part of a program to increase national insight and unity of the Indonesian nation.

LITERATURE REVIEW

The project-based learning model (PjBL) is innovative (Bastola, 2021) to connect classroom learning with students' real lives. The PjBL model was developed from Piaget's constructivist learning theory (Zhou, 2023), which states that students can construct knowledge through the real world. The PjBL learning model is oriented towards student activities (student-centered) carried out in groups and working autonomously. In implementing this model, teachers act as inspirers, motivators, facilitators, and supervisors (Al-busaidi & Seyabi, 2021). Implementing the PjBL learning model allows students to construct their knowledge more systematically.

As an innovative student-centered model, PjBL learning has characteristics based on inquiry activities and searching for answers to specific problems (Molina-Torres, 2022). Implementing PjBL learning provides opportunities for students to create and develop products appropriate to the learning topic to improve the learning process (Almulla, 2020). While developing and creating products, students have indirectly practiced solving or answering problems the teacher gave more complexly. Solving complex problems through product development also indirectly encourages students to have and develop creative thinking and critical thinking skills (Agnesita, 2023).

Implementing PjBL learning through group work (cooperative and collaborative) provides opportunities for students to work with other students who have different backgrounds (Lu & Smiles, 2023). Learning with cooperative and collaborative activities with students of different abilities, ethnicities, languages, and cultures provides opportunities to get to know each other's culture and habits, leading to mutual needs (Yang, 2023). Therefore, implementing the PjBL learning model can also increase the sense of unity among group members (even though they are of different ethnicities, religions, etc.), leading to the growth of tolerance among students. The main goal of implementing the independent curriculum in Indonesia is the growth of mutual understanding, cooperation, and tolerance (Khoirurrijal, 2022; Aryanti & Saputra, 2023).

Various studies related to Experts have carried out various studies on implementing the PjBL learning model. Implementing the PjBL learning model also covers various subjects, such as science, social science, economics, history, and religion. This research focuses on science and religion subjects because both are mandatory subjects in the independent curriculum and have a critical position. Science learning is the basis for technological development; however, according to the PISA test results, students' scientific literacy abilities in Indonesia still need to improve. Islamic religious learning is the primary basis for forming students' attitudes and character, as well as efforts to mainstream religious moderation, which has received significant attention from the Indonesian government.

Referring to the existing literature (research on the implementation of the PjBL model in Indonesia), it was found that research with a qualitative approach was relatively less than quantitative research. Apart from that, research that combines science and Islamic religion teachers in implementing the PjBL learning model still needs to be completed. According to many experts, qualitative and quantitative research are essential in developing educational programs (Ali et al., 2022; Sena Wahyu. et al., (2022). The limited amount of qualitative research and the lack of research that combines the perceptions of science teachers and Islamic religious teachers in Indonesia impacts the limited amount of accurate information as a basis for educational development. On the other hand, the limited amount of qualitative research also impacts the provision of meaning to educational research results, which need to be more comprehensive.

THEORETICAL/CONCEPTUAL FRAMEWORK

The leading theory used and the starting point in this research is the theory of Constructivism by Piaget and Social Constructivism by Vygotsky. Where in this theory, it is explained that a person's knowledge is closely related to their cognitive development and experiences through interactions with their environment (Triantafyllou, 2022; Wang, 2022; Chand, 2023). Apart from that, this research also refers to the pedagogical theory developed by John Dewey in implementing the PjBL learning model. Pedagogical theory states that education is a continuous process to achieve human perfection (Hassen, 2023).

From existing references, it is known that Piaget's theory, in general, has been widely adopted and used by experts. However, the central concept remains that students build and develop their knowledge through experience and previous knowledge. The urgency of constructivism theory can be seen in the implementation of inquiry-oriented learning (Havelka, 2015). In general, it can be said that

inquiry or discovery learning is a learning process with the idea that each individual (student) can learn optimally by being actively involved mentally and physically (Öztürk et al., 2022). Implementing constructivist theory in the learning process encourages the creation of an active and conducive learning atmosphere for each student to think, behave, and act scientifically (Thi et al., 2022). Therefore, it is believed that implementing constructivism theory in learning also provides sufficient space for optimal implementation of PjBL learning in all subjects.

I was referring to the general concept of the definition of learning (educational process) above that learning is an individual process and is influenced by various aspects, both internal and external to the individual (Sajirun et al., 2022; El Sayad, 2023; Untajana et al., 2023). One crucial factor that influences each individual's learning process is the aspect of social interaction as part of the student learning environment (Nurdin et al., 2023; Sudwiarrum et al., 2023; Ellinger et al., 2023). However, the concept of social interaction needs to be considered by the constructivism theory developed by Piaget. Therefore, this research combines Piaget's constructivism theory with Vygotsky's social and interpersonal interaction theory. Vygotsky's social interaction theory states that learning can occur optimally if it is done through social and interpersonal interactions, in this context in the guidance of adults or peer tutors (Topçiu & Myftiu, 2015; Grageda et al., 2022; Grageda et al., 2022). Vygotsky explained this in the Zone of Proximal Development (ZPD) theory, which experts have now used as a basis for developing innovative learning models.

Regarding implementing project-based learning, J. Dewey explained that every student consciously and actively participates and is fully involved in their learning. J. Dewey added that students successfully learn if they interact with their physical and social environment and the experiences they have previously gained. J. Dewey's theory has provided two main aspects in successfully implementing learning: psychological (personality) and sociological (social relationships). Even though the psychological aspect (personality/awareness) is the main foundation for student success, the sociological aspect remains crucial. Sociological aspects are another form of students' mental and physical activity with their environment and are essential for planning their future (Maida & Angeles, 2011).

Research purposes

Referring to the literature review related to the implementation of the PjBL learning model in Indonesia, it can be seen that the implementation of the PjBL model in schools is associated with learning outcomes (Made et al., 2022), scientific attitudes (Wicaksana & Sanjaya, 2022), creative thinking skills (Meldawati et al., 2022), and several other quantitative studies. However, more qualitative research is still needed to implement the PjBL model, especially regarding teacher perceptions among science and religion teachers. Even the research closest to this research, namely the implementation of the PjBL model in the Merdeka curriculum conducted by Alfatah & Seviyanti (2022), is still limited to explaining the urgency of the PjBL model in the Merdeka curriculum. Therefore, this research aims to add to qualitative literature while reducing existing literature gaps to improve the quality of Education in Indonesia in general. Apart from that, this research also aims to understand and describe the implementation of the PjBL model, especially in science and religion subjects, and to contribute to developing science and religion learning more effectively.

Problem statement

The problem formulation is stated and arranged systematically and sequentially in this research. The problem formulation is structured so that the respondents' explanations and answers are arranged systematically. Some of the main questions in this research are as follows:
1) What is the general understanding of science and Islamic religion teachers in PjBL learning in the context of the Merdeka curriculum?
2) How do science teachers and Islamic religious teachers plan PjBL learning in the context of their subjects?
3) What are the strategies of Islamic science and religion teachers in choosing and determining project themes that students must work on in PjBL?
4) What are the strategies of Islamic science and religion teachers in guiding and facilitating students during the project development process?
5) How do Islamic science and religion teachers develop instruments and carry out assessments of PjBL products by students?

RESEARCH METHODS

This research uses a qualitative approach; data collection is carried out through semi-structured interviews. In interviews, each respondent is free to answer according to their views, while the researcher is free to determine the order of questions. This change in order and freedom is intended to help respondents express their opinions, both personal and more complex institutional ones. Apart from that,

interviews are conducted to obtain the required information in a more complete and in-depth manner. Specifically, this research was conducted with a case study design. The case study design was chosen with the consideration that it is more appropriate and accurate for identifying problem-based issues and determining relationship patterns of events, developing various alternative possibilities and explanations for an event or phenomenon, and evaluating them appropriately (Prasad Bhatta, 2018; Hayden, 2022; Mtisi, 2022).

Participant

The participants or respondents in this research were 40 teachers consisting of 20 science teachers and 20 Islamic religious education teachers. The teachers come from state and private schools in Jambi. Apart from that, these teachers come from educational and religious institutions (under the Ministry of Religion of the Republic of Indonesia) and general (under the Ministry of National Education of the Republic of Indonesia). It aims to obtain information from various teachers' perspectives to make the data and research results more accountable.

Measurements and Tools

Data collection in this research was carried out through semi-structured interview techniques. The main reason for using semi-structured interview techniques is to facilitate the process of accurately coding, analyzing, and triangulating data. Semi-structured interviews also allow for obtaining data quickly and systematically (Mashuri et al., 2022; Elhami & Khoshnevisan, 2022; Naz et al., 2022). The quality of the instruments used in semi-structured interviews was tested through a preliminary study. The preliminary study test aims to ensure that the instrument has good quality, namely validity and reliability. Efforts to ensure the quality of the instrument (validity and reliability) were carried out by directing all questions prepared by the researcher to educational measurement experts from the Sulthan Thaha Saifudin Jambi State Islamic University. The instrument was also tested on several science and religion teachers who had carried out PjBL learning and were not included as respondents in this research. Next, the instrument (interview guide questions) was prepared systematically and sequentially according to the problem formulation and research objectives by considering input from experts and teachers during pre-research and then used to collect research data.

Data collection

After the list of questions in the interview guide is arranged neatly and systematically, the data collection process is then carried out. For data accuracy, apart from the interview results being recorded manually by the researcher, the interview process was also recorded via Android (audio data) after obtaining permission from the respondents. The interview process for respondents varies between 30-30 minutes depending on the development of the interview process. The interview was conducted individually in a laboratory room for science teachers and a particular room for religion teachers. During the interview, the atmosphere in the room was ensured to be calm and safe from all forms of disturbance.

Analysis

This research uses descriptive analysis techniques. The technique is one of the qualitative data analysis techniques experts recommend (Lane, 2011; Nassaji, 2015). Descriptive analysis techniques mainly aim to systematically display or present research data to the public or readers (Doyle et al., 2020; Sukmawati, 2023). The interview data was then reduced (some less relevant information was removed), classified, and analyzed (interpreted) in depth. The reduction, classification, and interpretation process is adjusted to the order of the research questions. In interpreting data, researchers build patterns of causal relationships between research data and existing theories or cases. In this research, the descriptive analysis technique refers to Nassaji's (2015) opinion through four steps: developing or compiling a research framework, processing or analyzing data, interpreting or interpreting, and making a research report.

To avoid research bias and fulfill the requirements of scientific ethics, this research did not include data or personal information of all respondents. All personal data or information about respondents is kept by researchers privately and is not published to the public. To simplify the data analysis process, each respondent was given a unique code: ST (for science teachers) and IRT (for Islamic religious teachers). To ensure no duplicate data, each ST and IRT code is given a sequential number, for example, TS1 (first science teacher respondent), IRT3 (third Islamic teacher respondent), and so on. The process of coding respondent data in this research follows the opinion of Skjott Linneberg and Korsgaard (2019) and Brailas et al. (2023), who explain that in qualitative research, data coding is used in data collection. The sequence and coding system are carried out carefully and systematically. Next, the validation of the coding system was carefully checked by experts from the Islamic University of Sulthan Thaha Saifuddin Jambi. The interview data is classified with a specific code based on the expert's assessment and evaluation. The reliability and accuracy of the research data are then calculated and

determined using a specific formula (Percentage). The percentage value obtained is a comparison or ratio between the total value and the item value used as a reference by researchers or evaluators.

RESEARCH RESULT

Based on the research objectives, this research aims to add data and information as well as qualitative literature to reduce existing literature gaps. This research also aims to understand and describe the implementation of the PjBL model, especially in science and religion subjects, and to contribute to developing science and religion learning more effectively. To achieve the goals above, several questions were prepared for the interview. Some of these questions are as follows:

Question 1: What is the general understanding of science and Islamic religion teachers in PjBL learning in the context of the Merdeka curriculum?

Understanding the concept of the PjBL learning model is an essential factor in successfully implementing the model. Therefore, the first question asked of teachers was related to their understanding of the PjBL model. The results of the interview can be seen in Table 1 below:

Table 1. Frequency (f) and Percentage (%) of teacher answers to Question 1

Coding	Perception	F	%
ST	Easy to implement	4	20
	Difficult to implerner	11	55
	Do not know	5	25
	Number of respondents	20	100
IRT	Easy to implement	2	10
	Difficult to implement	14	70
	Do not know	4	20
	Number of respondents	20	100

Teachers generally perceive that the PjBL learning model is difficult to implement in science subjects (55%) and Islamic religious education subjects (70%), as in Table 1. From the teacher's perspective, it is challenging to implement the PjBL learning model in their schools due to several factors, namely, the time required to complete a project is relatively long, the lesson schedule is busy, students' abilities vary, and the number of students in one class is too large.

Question 2: How do science teachers and Islamic religious teachers plan PjBL learning in the context of their subjects?

Successful implementation of the PjBL learning model starts with good planning. The second question asked of science and Islamic religion teachers was how they planned or prepared to implement PjBL model learning. The teacher's answer to this question can be seen in Table 2 below:

Table 2 Frequency (f) value of teacher answers to Question 2

Coding	Perception	F	%
ST	Make good plans	3	15
	It is not easy to plan	10	50
	Do not know	7	35
	Number of respondents	20	100
IRT	Make good plans	2	10
	It is not easy to plan	14	70
	Do not know	4	20
	Number of respondents	20	100

Questions regarding teachers' perceptions of PjBL learning planning in the independent curriculum. In general, science and Islamic religious education teachers perceive that it is "difficult" to plan PjBL learning. Some of the teacher's answers to the second question are as follows:

Table 3. Quotes from interview results regarding the second question

Coding	Teacher's Answer
ST1	The PjBL model is a central part of our independent curriculum. Apart from that, PjBL also has many benefits for students. Therefore, I am applying it in science learning. I follow the PjBL syntax that experts have developed step by step. Even though I encountered various obstacles, I resolved them satisfactorily.
ST3	The PjBL learning model is innovative and part of the independent curriculum However, implementing this model takes up much effective time, as well as students' energy, so I do not do it; I prefer to teach science concepts directly in class.
ST6	Science lessons are complex material. My mastery of science concepts over the years since I taught at this school has yet to be genuinely satisfactory; it is often below standard. Therefore, I focus on mastering the concept rather than the learning model. So, the PjBL model will be complex for teachers and students and take up much time.
ST18	I have known about the PjBL learning model since I was studying at university, but I just learned that this model was part of the independent curriculum. While teaching science at this school, I have never done PjBL learning; I prefer teaching science using simulations or YouTube videos, which will make students happier and more motivated.
IRT2	I have been teaching Islamic religious education for quite a long time, 19 years. From that experience, I know that the PjBL model is a learning model that is learner-oriented, and the result is a product. I am happy with this model because, in the end, students can make various kinds of products, for example, posters, calligraphy, and quotes with Islamic religious nuances. I can plan and execute well and have done it many times in my class.
ITR7	The PjBL learning model is excellent and innovative. Unfortunately, the few times I tried to do this in class with students, I often failed, targets were not achieved, and even the primary material in the mandatory curriculum was neglected. The PjBL model consumes much time.
IRT9	The independent curriculum we are implementing recommends that teachers carry out learning using the PjBL model. As a teacher, I welcome this. However, I experienced many obstacles in its implementation, such as determining the project topic, the time required, preparing the instruments used for product assessment, etc. I have followed the steps developed by experts, but I still need help to do them well.
IRT14	For me, the PjBL learning model is more suitable for studying science. Studying religion will be difficult if you use the PjBL model because learning religion cannot be done experimentally like science. Therefore, I want to understand why the government requires the PjBL learning model for all fields of study, including Islam. It has the potential to reduce the meaning of studying Islam. So, I never implemented the PjBL model in my class.

ST: Science Teacher
IRT: Islamic Religious Teacher

Referring to the data above (Table 1 and Table 2), general science and religion teachers perceive or state that PjBL learning cannot be implemented well in schools. Teachers still face various technical obstacles in implementing the PjBL model. To implement a good PjBL learning model in schools, teachers suggest reducing the number of students in one group. Apart from that, the learning load in the curriculum also needs to be reduced so that teachers and students can implement PjBL without the pressure of limited time and curriculum achievements.

Question 3. What is the strategy of Islamic science and religion teachers in choosing and determining project themes that students must work on PjBL?

The success of implementing the PjBL learning model is largely determined by the teacher's success in selecting and determining the topics that students must work on in PjBL. Therefore, the focus of the third question in this research is how teachers choose and determine the topic. The results of the interview regarding the teacher's answers to this question are shown in Table 4 below:

Table 4. Frequency and Presentation of Teacher Answers to Question 3

Coding	Perception	F	%
ST	Determine the topic together with the students.	2	20
	The choice of topic is the teacher's authority; students carry it out in groups.	15	75
	Do not know	3	15
	Number of respondents	20	100
IRT	The teacher determines the topic through discussions with other teachers (one field of study) and chooses several topics relevant to the curriculum, discussing with students to determine topics appropriate for each group.	2	10
	The teacher chooses the topic directly.	14	70
	Do not know	4	20
	Number of respondents	20	100

Table 4 above shows that general teachers (75% of science and 70% of Islamic religion teachers) stated that topic selection is the teacher's authority. Therefore, the teacher chooses the project topic directly and then distributes it to students to work on in groups. This fact shows that the teacher's perception of students' independence and ability in choosing project topics in learning is relatively weak. However, some teachers involve students in selecting project topics, although it is not stated whether, in the end, the topic selection remains the authority of the teacher or a combination of teacher and student opinions. Some quotes from the teacher's answers to question 3 are as follows:

Table 5. Several quotes from interviews with science teachers and Islamic Religious Education teachers

Coding	Teachers Answer
ST4	To facilitate students' creativity and critical thinking skills, in selecting project topics, I refer to the applicable curriculum, then carry out an analysis to look at relevant topics, and then jointly make an agreement with students regarding the topics chosen to be worked on during one semester.
ST7	So far, I have prepared exciting topics for students. I chose these topics based on the independent curriculum and then distributed them to students in groups.
ST11	Choosing a topic for a project is my job as a teacher; I do this to ensure that all topics chosen are by the applicable curriculum. These topics of my choice are then discussed (what the student group is doing) with the students so they can be worked on according to their group members.
ST20	Because I have never done project-based learning, I did not choose any topic to work on PjBL.
IRT4	Implementing the PjBL learning model must align with the applicable curriculum. Therefore, in selecting topics, I discussed with other teachers (one field of study) and chose several topics relevant to the curriculum. Then, discuss with students to determine appropriate topics for each group.
ITR9	The teacher must choose a topic to ensure its suitability to the applicable curriculum. Therefore, I choose a topic for each group of students. Students carry out group assignments independently.
IRT11	Regarding selecting topics for implementing PjBL learning, I have prepared these topics as a teacher. Therefore, it is easy to find topics, but students focus on the topics provided by the teacher to be implemented.
IRT16	Choosing a learning topic is part of learning planning. Therefore, the teacher should choose a topic relevant to the existing curriculum. Unfortunately, I have never done this PjBL learning, so I do not know exactly how the mechanism works.

Referring to the data above, it can be understood that teachers have different views or perceptions in selecting project topics. However, most teachers stated that the teacher should do topic

selection. The teacher's selection of project topics is carried out to ensure that the project topics carried out by students are in line with the applicable curriculum, making it easier for students to select topics and by the student's abilities.

Question 4. What are the strategies of Islamic science and religion teachers in guiding and facilitating students during the project development process?

The next question (question 4) that researchers asked of science and Islamic religious education teachers was related to implementing PjBL model learning, which includes guidance and facilitation during the project work process. The teacher's answers to these questions are summarized in Table 6 below:

Table 6. Frequency and Percentage of Teacher Answers

Coding	Perception	F	%
ST	Provide regular guidance every week (during regular science class hours), provide motivation, direct and provide solutions to student problems	4	20
	Conduct regular and independent discussions and guidance (inside and outside science class hours)	13	65
	Not providing PjBL guidance	3	15
	Number of respondents	20	100
IRT	Provide regular guidance every week (during regular Islamic teaching hours), provide motivation, direct and provide solutions to student problems	3	15
	Conduct regular and independent discussions and guidance (inside and outside Islamic teaching hours)	13	65
	No guidance	4	20
	Number of respondents	20	100

Referring to the table above (Table 6), teachers in general (around 65%) provide guidance, motivation, and direction relatively well; they do this inside and outside class hours. According to the teacher, this was done to ensure that guidance and discussions on student project implementation did not interfere with regular hours (to fulfill curriculum obligations). According to the teacher, although some of the discussions and directions were carried out during regular hours, they were carried out in a general manner. However, some teachers (around 20%) do it during regular hours. Some quotes from teachers' opinions or perceptions regarding the answer to question 4 are as follows:

Table 7. Quotes from the teacher's answer to question 4

Coding	Teacher Answer
ST3	The PjBL learning model is significant for me, so students must receive serious and regular guidance. I do regular tutoring every week (during regular science class hours). In this guidance, I provide direct motivation and solutions to students' problems in implementing their projects.
ST5	I provide regular and independent guidance to students during project implementation. I provide this guidance regularly, for example, in class when studying science and outside science class hours if necessary.
ST13	Implementing project learning takes much time. Therefore, more than guidance during science learning in class is required. I often tutor students outside of science class hours, even several times on weekends. It ensures that the projects the students are working on run smoothly.
ST19	While teaching science at this school, I had never done the PjBL model, so I did not do any guidance regarding it, even though it looked exciting.
IRT4	Islamic studies are relatively easy for students. Therefore, I am not too worried that they will miss out on curriculum material so that guidance to students in carrying out projects can be carried out periodically every week (during regular Islamic teaching hours). During guidance, I provide motivation and direct and solve student problems.
ITR9	In my class, PjBL learning is carried out in grade 8; generally, they already know how to implement the project. Therefore, I guide them through regular and independent discussions and guidance (inside and outside Islamic teaching hours).
IRT11	I guide the implementation of student projects using discussions during religious class hours.

	That is enough, considering that religion projects differ from science subjects.
IRT16	My class's implementation of Islamic learning has never used the PjBL model.

Question 5. How do Islamic science and religion teachers develop instruments and carry out assessments of PjBL products by students?

One of the critical points in implementing the PjBL learning model is the assessment of products students develop. Therefore, one of these research studies focuses on finding out how Islamic science teachers develop assessment instruments for project products developed by students. A summary of the teacher interview results regarding question five is shown in Table 8 below:

Table 8 Frequency and Percentage of Teacher Answers to Question 5.

Coding	Perception	F	%
ST	The project assessment instrument was developed based on the indicators previously mentioned in the lesson plan, namely planning, product creation process, results/products, and Presentation by the group, including the contribution of each participant and the originality of the product developed.	5	25
	Instrument development in the form of an assessment rubric regarding product quality, details of development stages, product quality, and product presentation or description	12	60
	Do not assess PjBL products	3	15
	Number of respondents	20	100
IRT	Assessments carried out on products include development planning, development results (neatness, quality, and originality), timeliness of product manufacture, and expert assessment (other Islamic religious teachers).	5	25
	Product assessment is carried out by considering product quality: neatness/harmony, correctness of material substance, and product presentation by the group.	13	65
	Not evaluating PjBL products	2	10
	Number of respondents	20	100

Referring to Table 8 above, in general (65% of science teachers and 60% of Islamic Religion teachers) have assessed the PjBL project relatively well. Many teachers who assess products do not or do not consider conformity with the applicable curriculum, development planning, and scientific attitudes. Even though some teachers have carried out systematic assessments, some still do not assess students' work for various reasons. Below are several quotes from interviews with science teachers and Islamic religious teachers:

Table 9 Quotes of Teacher's Answers to Question 5

Coding	Teacher Answer
ST3	To assess student project results, I use an assessment instrument developed based on the indicators previously mentioned in the lesson plan, namely planning, product creation process, results/products, and Presentation by the group, including the contribution of each participant and the originality of the product developed. So, the value is obtained based on the achievement of these indicators.
ST5	I developed an instrument for assessing project results through a rubric. The rubric assesses several aspects: product quality, details of development stages, product quality, and product presentation or description.
ST13	For me, assessing student product results from projects is not very important. Generally, the grades obtained on these products do not influence the student's final semester grades. Therefore, I assess it like other ordinary tasks.
ST19	I have never carried out project activities during learning, so I did not assess the PjBL product.
IRT4	Project activities are one of the essential activities and are included in the independent curriculum. Therefore, assessing student work (products) is also very important. I conduct assessments of student products, including development planning, development results

	(neatness, quality, and originality), timeliness of product creation, and expert assessments (other Islamic teachers) so they are more valid.
ITR9	The product assessments I have carried out so far have always considered product quality, namely neatness/harmony, correctness of material substance, and product presentation by the group. It aims to make the assessment fairer and from different points of view.
IRT11	Usually, the products of students' work in Islamic studies in my class are in the form of calligraphy (beautiful writing in Arabic); therefore, in assessing them, I consider the truth of substance, beauty, and group cohesiveness during the creation process.
IRT16	As long as I teach Islamic religious education at this school, I have not assessed the PjBL product because I have never implemented that model.

Based on Table 9 above, science and Islamic religious teachers perceive PjBL work results similarly. However, they have different methods and instruments for carrying out their assessments. The differences in assessment methods depend on the product developed by the student. Some teachers still need to implement PjBL learning for various reasons, so they do not conduct product assessments. More in-depth interviews found that teachers who still needed to carry PjBL learning were generally new or honorary teachers.

DISCUSSION

For systematic purposes and to make it easier to understand the results of this research, the discussion is carried out sequentially according to the questions asked in this research.

What is the general understanding of science and Islamic religion teachers in PjBL learning in the context of the Merdeka curriculum?

Referring to the interview data above, it can be understood that, in general, most science teachers and Islamic religious teachers consider the PjBL learning model to be an innovative learning model oriented toward product development. As a model oriented towards product development, teachers also understand that the PjBL model is critical for students to practice critical thinking, creative thinking, problem-solving, and working together in groups. Apart from that, teachers generally also understand that PjBL learning is one of the models recommended in the independent curriculum and can be applied to all fields of study. The teacher's understanding aligns with implementing the PjBL model in the Merdeka curriculum. It is known that the aim of implementing the Merdeka curriculum in Indonesia is to increase student competency and strengthen the Pancasila Student Profile project (Martati, 2022). The independent curriculum can be implemented through the PjBL learning model (Dewi, 2022; Wicaksana & Sanjaya, 2022). Thus, teachers know and understand that the PjBL learning model is an effort to implement an independent curriculum in Indonesia.

How do science teachers and Islamic religious teachers plan PjBL learning in the context of their subjects?

Data related to teachers' ability to plan PjBL learning (second research question) can be understood that, in general, teachers (both science teachers and Islamic religion teachers) have perceptions or state that PjBL learning is not or cannot be implemented optimally in schools. Teachers still face various technical obstacles in implementing the PjBL model. To implement a good PjBL learning model in schools, teachers suggest reducing the number of students in one group. Apart from that, the learning load in the curriculum also needs to be reduced so that teachers and students can implement PjBL without the pressure of limited time and curriculum achievements.

To optimize the process and improve learning outcomes, the suggestions made by teachers regarding reducing the number of students in class are in line with the opinion of Wahyuningsih et al. (2020) that the ratio of numbers in class influences the effectiveness of the learning process. Nafi'ah Islakhudin (2020) also found that the ratio of the number of students in a class influences the social-cognitive development of students. Ajani and Akinyele (2014) and Zhou (2023) also stated that the ratio of students in a class also influences student learning outcomes. Thus, the government needs to consider reducing or idealizing the ratio of students in each class in Indonesia.

What is the strategy of Islamic science and religion teachers in choosing and determining project themes that students must work on?

The research results (Table 4) show that general teachers (75% of science and 70% of Islamic religion teachers) stated that topic selection was the teacher's authority. Therefore, the teacher chooses the

project topic directly and then distributes it to students to work on in groups. This fact shows that the teacher's perception of students' independence and ability in choosing project topics in learning is relatively weak. However, some teachers involve students in selecting project topics, although it is not stated whether, in the end, the topic selection remains the authority of the teacher or a combination of teacher and student opinions. The involvement of students in selecting topics in the PjBL project positively impacts the student learning process and outcomes. It even positively impacts the development of students' scientific attitudes (Bryson, 2016). Active involvement of students in learning can also increase students' satisfaction and positive learning perceptions (Gray & Diloreto, 2016). Thus, teachers need to involve students more optimally to support the success of PjBL learning to support the implementation of the independent curriculum in Indonesia. However, the selection of project topics by teachers is carried out to ensure that the project topics carried out by students are in line with the applicable curriculum, make it easier for students to choose topics, and are by the student's abilities, and cannot be blamed.

What are the strategies of Islamic science and religion teachers in guiding and facilitating students during the project development process?

The answers of science and Islamic religious teachers related to the fourth question show that teachers in general (around 65%) carry out guidance and provide motivation and direction relatively well; they do it inside and outside class hours. According to the teacher, this was done to ensure that guidance and discussions on student project implementation did not interfere with regular hours (to fulfill curriculum obligations). The teacher's attention in guiding the PjBL product development process aligns with Markula & Aksela's (2022) statement that there are several essential keys in PjBL learning.

According to the teacher, although some discussions and directions are carried out during regular hours, they are generally carried out, namely providing motivation and general direction. However, some teachers (around 20%) do it during regular hours. Referring to the data, it is understood that, in general, the guidance carried out by teachers needs to run optimally because it does not focus on project activities. In addition, most project activities are completed outside the classroom with less teacher supervision, so other parties may be involved in completing the product. It has an impact on the relatively weak accuracy of project work results.

How do Islamic science and religion teachers develop instruments and assess PjBL products by students?

The results of this research show that in general (65% of science teachers and 60% of Islamic religion teachers) have assessed the PjBL project relatively well. Many teachers who carry out product assessments do not or do not consider the achievement and conformity with the applicable curriculum. As previously mentioned, the independent curriculum aims to develop the attitudes or character of Pancasila students. However, the assessments carried out by teachers do not consider the achievement of these attitudes.

Apart from that, even though teachers have carried out assessments systematically by developing assessment rubrics, some teachers still do not assess students' work for various reasons. The absence of systematic evaluation by several science and Islamic religious education teachers shows that some teachers still need help understanding the urgency of the review for achieving educational goals. Therefore, to improve the quality of education in general, the government needs to develop training to strengthen teacher competency and commitment (teacher performance). According to Poro et al. (2019), Murkatik et al. (2020), Nyakundi (2020), and Diantebes et al. (2022), these two things support the success of educational programs.

CONCLUSION

In conclusion, science and Islamic religious education teachers generally understand that the PjBL learning model significantly develops students' abilities. They also know that the PjBL learning model is essential in implementing the independent curriculum. However, this research found that, in general, teachers perceive or think that the PjBL learning model cannot be implemented optimally in schools. Some of the reasons mentioned by teachers include the fact that the curriculum content is still relatively dense, the number of students in one class is large, and the implementation of the PjBL model tends to take up much time. Referring to the results of this research, active teacher participation is only in planning and assessment. In contrast, in the project creation process, the teacher's contribution could be more optimal because project creation is carried out outside class hours and even outside school, so there is potential for the involvement of other people unknown to the teacher.

AUTHOR CONTRIBUTIONS

This research is a collaboration between two researchers across scientific fields. All research processes are carried out collaboratively, from plan development, data collection, analysis, and report writing. The second author (Sukarno) prepared it as an article and other stages according to scientific work publication procedures for publication purposes. The two researchers stored all data in the research for further research.

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