

TEACHERS' STRATEGIES FOR BUILDING RELIGIOUS CHARACTER AND STUDENTS' CURIOSITY THROUGH PHYSICS TEACHING

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Abstract :

This study aims to explore the strategic role of physics teachers in developing students' religious character and curiosity through character-based science education. Using a qualitative naturalistic approach, the research was conducted at SMAN 10 Jambi, focusing on one physics teacher and selected students from class XI F4 through snowball sampling. Data were collected using interview guides and documentation, then analyzed through Miles and Huberman's interactive model, including data reduction, display, and conclusion drawing. The results show that the teacher plays a significant role in fostering religious values by integrating spiritual reflections into physics lessons, such as linking scientific concepts to the greatness of God and encouraging gratitude through learning activities. Simultaneously, the teacher cultivates curiosity by using inquiry-based strategies, encouraging students to question, discuss, and explore natural phenomena actively. This combination strengthens both moral and scientific reasoning among students. The novelty of this study lies in the integration of two core characters religiosity and curiosity within a single instructional framework of physics education. The implication of this research highlights that character-based physics teaching not only enhances conceptual understanding but also promotes holistic student development, balancing scientific inquiry with spiritual awareness, and thus contributes to the advancement of humanistic-oriented physics education.

Keywords: Character-based education, Curiosity, Physics teaching, Qualitative study, Religious character.

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INTRODUCTION

Science education not only aims to shape students' cognitive abilities in understanding scientific concepts, but also has an important role in shaping students' character. (Taufiqurrahman, 2023; Wekerle et al., 2022). Physics as part of science education offers space to develop logical and analytical thinking skills, as well as a deep scientific attitude. (Cynthia et al., 2023; Darmaji et al., 2019; Matsun et al., 2019). However, in the practice of physics learning in the classroom, affective dimensions such as religious character and curiosity often do not receive optimal proportions. (Dori et al., 2018; Novitra et

al., 2021; Zhou et al., 2021). In fact, this character is a crucial foundation for a generation that is not only intellectually intelligent but also possesses moral integrity and a strong spirit of exploration.

Religious character refers to spiritual and ethical values reflected in students' daily behavior, such as honesty, gratitude, and discipline based on religious values. (Pridayanti et al., 2022; E. Rahmadani & Al Hamdany, 2023; Suastra, 2013). Meanwhile, curiosity is the main driving force in science learning, because this is where the enthusiasm for asking, observing, and experimenting is born (Hakim & Marzuki, 2019; Raharja et al., 2018). Therefore, teachers have a strategic role as facilitators in creating a learning environment that not only stimulates students intellectually but also instills noble values aligned with national education goals.

In the context of physics learning in secondary schools, teacher strategies are key to integrating character values into the learning process (Kiel et al., 2020; Oyedeji, 2017; Skrbinjek et al., 2024). These strategies can include selecting active learning methods, utilizing local-religious contexts, and incorporating religious values into scientific discussions (Jarrett et al., 2022; Yantoro et al., 2021). Teachers who are able to manage physics learning with a humanistic approach will encourage students not only to understand Newton's or Ohm's laws, but also to foster a sense of awe for God's creation and a passion for in-depth inquiry into natural phenomena (Kasi et al., 2024; Sholahuddin & Admoko, 2021).

The presence of the Independent Curriculum, as a new paradigm in Indonesian education, provides greater scope for the holistic development of student character (Asrial et al., 2024; Farikhah, 2017; D. P. Rahmadani et al., 2024; Socrates et al., 2023). Through the Pancasila Student Profile, which serves as a reference in this curriculum, religious character and curiosity are included among the six main dimensions that need to be developed. In physics learning, these values can be contextualized through scientific inquiry activities that remain rooted in the values of divinity and diversity. The implementation of character-based physics learning in the Independent Curriculum emphasizes the importance of teachers' role in developing a meaningful, relevant learning process rooted in Pancasila values.

Previous research has highlighted the importance of character education in science learning. For example, integration of values in science learning can significantly improve students' spiritual attitudes (Abdullah et al., 2019; Suastra, 2013). In addition, research by (Fatkul Jannah et al., 2021) revealed that inquiry-based learning strategies can increase students' curiosity and active participation in physics. However, few studies have specifically examined how teachers' strategies can simultaneously develop these two character traits in the context of physics learning in high schools, particularly in the Jambi region.

This research is novel because it specifically examines the strategic role of teachers in developing religious character and students' curiosity through physics teaching, using a contextual approach based on local values. This study not only identifies the strategies used but also analyzes their relationship to the objectives of the Independent Curriculum and the values of Pancasila. This research combines character education and science pedagogy approaches in a local context that has not been widely explored by previous studies.

The urgency of this research lies in the urgent need to strengthen students' character amidst the challenges of globalization, technological disruption, and the moral crisis affecting the younger generation. Schools, as formal educational institutions, have a significant responsibility to create learning spaces that shape students into individuals with faith, critical thinking, and a love of knowledge. Teachers, in this case, become agents of transformation, capable of bridging academic competency and character development through relevant learning strategies (Kogoya et al., 2023; Marsita et al., 2023; Shofwan et al., 2025). Therefore, uncovering and describing teacher strategies in this context is a crucial step in enriching the discourse on character education in science learning.

Against this background, this study aims to describe and analyze the strategies used by physics teachers to build religious character and curiosity in students at SMAN 10, Jambi City. This research is expected to provide practical contributions for educators, curriculum developers, and education policymakers in designing science learning that is more humanistic and rooted in national character values. Furthermore, the results of this study can also serve as a reference in strengthening the implementation of the Independent Curriculum in a more holistic and contextual manner.

RESEARCH METHOD

This study employed a qualitative approach with a naturalistic approach. This approach was chosen because the researcher sought to deeply understand the strategic role of teachers in developing religious character and curiosity in students through physics instruction in a natural school context. Naturalistic research allows for observation of behavior, interactions, and learning strategies as they occur without variable manipulation, thus obtaining an authentic picture of the dynamics of character learning in the classroom (Neupärtl et al., 2021; Salsabila et al., 2024; Suprayitno et al., 2024).

The research was conducted at SMAN 10 Jambi City, focusing on the physics learning process in class XI F4. The participants in this study consisted of one physics teacher and 12 students from class XI F4. The student participants were selected to represent diverse characteristics, including gender (6 female and 6 male students), varying academic abilities (high, medium, and low based on their physics achievement scores), and different levels of learning engagement observed during classroom activities. This variation was intended to capture a comprehensive picture of students' curiosity and religious character in the learning process.

The sampling technique used was snowball sampling. Initially, the researcher selected the physics teacher as the key informant due to their central role in managing and understanding classroom learning dynamics. Subsequently, student participants were identified based on recommendations from the teacher and initial student informants, with consideration of specific criteria such as activeness in class discussions, willingness to participate, and ability to reflect on their learning experiences. Although classroom-based research generally involves a limited and defined population, snowball sampling was employed to ensure the selection of information-rich participants who could provide in-depth and relevant data regarding the integration of curiosity and religious character in physics learning. This approach is appropriate for qualitative naturalistic studies that prioritize depth over generalization (Adeoye, 2023).

The study was conducted over a period of approximately eight weeks. Data collection was carried out through classroom observations and in-depth interviews. Observations were conducted six times during regular physics lessons to capture authentic learning interactions. In addition, semi-structured interviews were conducted with the teacher (2 sessions) and each student participant (1–2 sessions per student), depending on data saturation. This combination of repeated observations and interviews allowed the researcher to obtain comprehensive and consistent data regarding the phenomena under study.

Data collection was conducted using two main instruments: an interview questionnaire and documentation. For these interviews, the researcher prepared an interview guide in the form of a list of information to be obtained in the study. The interview guidelines for physics teachers at SMA Negeri 10, Jambi City, are as follows:

Table 1. Teacher Interview Guidelines for Religious Character

| No | Question Indicators | Sub-Indicators | Number of Grains |
|--------|-------------------------|---------------------|------------------|
| 1 | Learning Tools | Learning Tools | 4 |
| | | Media | 2 |
| 2 | Learning Implementation | Learning Strategies | 2 |
| | | Learning Models | 3 |
| 3 | Learning Evaluation | Assessment Aspects | 1 |
| 4 | Obstacles | Inhibiting Factors | 3 |
| | | How to Overcome | 2 |
| Amount | | | 17 |

Source: (Taja et al., 2021)

The outline for teacher interviews on the character of curiosity is presented in Table 2 below:

Table 2. Outline for Teacher Interviews on the Character of Curiosity

| No | Question Indicators | Number of Grains |
|----|---|------------------|
| 1 | Stimulate student curiosity | 2 |
| 2 | Encourage students to ask questions | 2 |
| 3 | Encourage interest in learning | 2 |
| 4 | Create a fun and engaging atmosphere when facing questions | 2 |
| 5 | Cultivate a spirit of finding solutions to difficulties in understanding the material | 2 |
| | Total | 10 |

Source: Modified from Rohmah et al. (2022)

The next interviews were conducted by researchers with students at SMA Negeri 10, Jambi City. Researchers interviewed several students recommended by their physics teachers, as well as several students recommended by other students who had already participated in the interviews. The interview guidelines for students at SMA Negeri 10, Jambi City, are as follows:

Table 3. Student Interview Outline Regarding Religious Character

| No | Question Indicators | Sub-Indicators | Number of Grains |
|-----------------------|------------------------------|--------------------|------------------|
| 1 | Learning Tools | Learning Tools | 2 |
| | Learning Implementation | Learning Materials | 5 |
| Media | | 3 | |
| Learning Introduction | | 5 | |
| 2 | Learning Evaluation Barriers | Core Learning | 9 |
| | | Activities | |
| | | Closing Activities | 2 |
| 3 | Total | Assessment Aspects | 1 |
| 4 | Question Indicators | Inhibiting Factors | 4 |
| | Learning Tools | | 31 |

Source: Adopted from Triza (2024)

The outline for student interviews on the character of curiosity is presented in Table 4 below:

Table 4. Outline for Student Interviews on the Character of Curiosity

| No | Question Indicators | Number of Grains |
|----|---------------------|------------------|
| 1 | Enthusiasm | 2 |
| 2 | Discipline | 2 |
| 3 | Reading | 2 |
| 4 | Asking Questions | 2 |
| 5 | Discussing | 2 |
| | Total | 10 |

Source: Silvia & Ropida (2022)

Data analysis was conducted using the interactive analysis model from Miles and Huberman, which includes three main stages: data reduction, data presentation, and conclusion drawing/verification. The data reduction process was carried out by selecting, simplifying, and focusing the raw data from observations and interviews. Data presentation was carried out in the form of descriptive narratives, thematic matrices, and direct quotations to reveal certain patterns or tendencies. The final stage, drawing conclusions, was carried out continuously by verifying the findings through triangulation of sources and techniques, to ensure the validity and credibility of the data. Sugiyono (2014) describes the analysis of research data using the

Miles and Huberman model, namely: data reduction, data display, and conclusion drawing, as shown in the following figure:

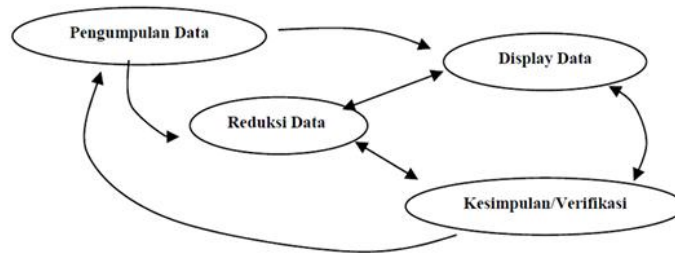


Figure 1. Illustration of the Miles and Huberman Data Analysis Model

RESULTS AND DISCUSSION

This study aims to describe the strategic role of teachers in developing students' religious character and curiosity through physics instruction at SMAN 10 Jambi City. Based on interviews with physics teachers and grade XI F4 students, various findings were obtained demonstrating how religious values and curiosity are integrated into physics learning. Data analysis was conducted through the stages of reduction, presentation, and drawing conclusions using the Miles and Huberman model (Sugiyono, 2014). The findings of this study are presented in two main sections: (1) The role of teachers in developing students' religious character through physics instruction, and (2) The role of teachers in fostering students' curiosity in physics learning.

Interview results indicate that physics teachers play an active role in instilling religious values through various learning stages, from planning to evaluation. Teachers link physical phenomena to the greatness of God's creation, instill discipline and responsibility in practical activities, and assess not only cognitive aspects but also spiritual and social attitudes.

Table 5. Teacher Interview Findings Regarding Religious Character Development in Physics Learning

| No | Aspects/Indicators | Implementation Methods | Field Findings | Interpretation |
|----|---------------------|---|---|---|
| 1 | Learning Tools | Teachers incorporate religious values into lesson plans and learning objectives | The lesson plan contains the statement "grateful for God's greatness for the laws of nature." | The teacher emphasizes that physics is a means of understanding God's greatness |
| 2 | Learning Media | Use videos of natural phenomena and relevant Quranic verses | Visual media is combined with spiritual reflection. | Media helps foster students' religious awareness |
| 3 | Learning Strategies | Discussion-based learning and value reflection | Teachers ask about the spiritual meaning behind physical phenomena. | This strategy strengthens students' scientific and spiritual understanding |
| 4 | Learning Evaluation | Assess aspects of spiritual and social attitudes | Assessment includes indicators of "gratitude" and "responsibility." | Evaluation reflects a balance between cognitive and character aspects |
| 5 | Barriers | Time constraints and differences in student backgrounds | Not all students understand the connection between science and religiosity. | Teachers need reflective strategies and a contextual approach |

Source: Interview data of physics teachers at SMAN 10 Jambi City (2025)

In addition to teacher interviews, student interviews revealed positive perceptions of physics instruction oriented toward religious values. Students felt that teachers frequently reminded them of spiritual values and linked them to physics concepts.

Table 6. Student Perceptions of the Application of Religious Character in Physics Learning

| No | Observed Aspects | Student Statements | Significance of the Findings |
|----|--------------------------|---|---|
| 1 | Introduction to Learning | Teachers often open lessons by relating the topic to God's creation. | Religious values emerge from the beginning of learning |
| 2 | Core Activities | We are encouraged to consider that force, energy, and natural laws are evidence of God's power. | Physics is seen as a manifestation of God's greatness |
| 3 | Closing Activities | Teachers always close lessons with an invitation to be grateful. | Learning fosters a reflective and spiritual attitude |
| 4 | Obstacles | Our students sometimes consider this merely a formality. | Religious values have not been fully internalized by all students |

Source: Classroom student interview data XI F4 SMAN 10 Kota Jambi (2025)

Physics teachers also have specific strategies for fostering students' curiosity, such as asking provocative questions, encouraging simple experiments, and creating an open and enjoyable learning environment.

Table 7. Teacher Interview Findings Regarding the Development of Students' Curiosity

| No | Indicators | Teacher Strategies | Implementation Example | Impact on Students |
|----|---------------------------------------|--|---|--|
| 1 | Encouraging Curiosity | Providing provocative questions at the beginning of the lesson | "Why do objects float in water?" | Students are encouraged to think critically and seek answers |
| 2 | Encouraging Students to Ask Questions | Providing space for open-ended questions without fear of making mistakes | The teacher praises students who ask questions. | Students become more active and confident |
| 3 | Interest in Learning | Relating material to everyday phenomena | Example: friction on bicycle brakes. | Students feel physics is close to real life |
| 4 | Enjoyable Atmosphere | Using mini-experiments and group quizzes | The class becomes more lively and collaborative. | Increases enthusiasm and motivation to learn |
| 5 | Enthusiasm for Finding Solutions | Encouraging small group discussions | Students are asked to find solutions to failed experiments. | Develops a sense of responsibility and perseverance |

Source: Results of physics teacher interviews (2025)

Meanwhile, interviews with students indicated that they were more motivated to learn when physics lessons fostered curiosity and provided opportunities to explore their ideas. The findings of this study describe the practices and perceptions related to the role of physics teachers in integrating religious character within classroom learning. Based on the data presented in Tables 1 and 2, the teacher was observed to consistently incorporate religious values into teaching materials, instructional strategies, and evaluation processes. For instance, physics concepts such as Newton's laws and energy were occasionally linked to reflections on God's greatness. From the students' perspective, this approach contributed to their awareness that physics learning is not solely oriented toward academic achievement, but also involves elements of faith and gratitude. However, it is important to emphasize that these findings are descriptive in nature, reflecting observed practices and participant perceptions within a specific classroom context, rather than measuring long-term impacts on students' religious character.

Similarly, the findings presented in Tables 3 and 4 indicate that the teacher implemented various strategies perceived to support the development of students' curiosity. Classroom observations and student responses suggest that activities such as questioning, experimentation, and problem-solving were encouraged during the learning process. Students appeared more engaged and willing to participate actively in discussions and experimental tasks. These results illustrate how curiosity can be facilitated through instructional practices; however, this study does not claim to assess sustained or long-term

development of students' inquisitive character, but rather captures its manifestation during the observed learning sessions.

Furthermore, the findings suggest that the teacher's role extends beyond delivering content to modeling values and fostering a learning environment that integrates both religious awareness and scientific inquiry. The coexistence of these aspects was evident in classroom interactions, where spiritual reflections and inquiry-based activities were implemented in parallel. This indicates a potential alignment between religious character and curiosity within the observed practices (Fakhrudin Siswopranoto, 2022; Sirait, 2023). Nevertheless, these conclusions remain limited to the specific context of one teacher and one class, and should not be generalized to broader educational settings without further supporting evidence.

The results of this study are consistent with previous research indicating that values-based science learning is associated with increased student engagement and awareness of moral dimensions in learning (Ningsih et al., 2021; Rosyida & Saputri, 2022). In addition, Triza (2024) highlighted that integrating religious values into physics instruction can enhance students' awareness of the meaning behind scientific phenomena. However, unlike some prior studies that imply broader impacts, the present study is confined to describing how such integration is practiced and perceived in a natural classroom setting. Therefore, the contribution of this study lies more in providing contextual and empirical descriptions rather than making causal or generalized claims.

The novelty of this research lies in illustrating the coexistence of religious character and curiosity within actual classroom practices. While previous studies have often examined these aspects separately, this study documents how both are simultaneously present in teaching and learning activities. Using a naturalistic approach, the findings offer a contextual understanding of how value-based and inquiry-based strategies can be implemented together. This contributes to the conceptual discussion on more holistic science learning, although further research is needed to examine its effectiveness across different contexts and over longer periods.

Practically, the findings suggest that teachers may consider integrating reflective and inquiry-based elements within physics learning, such as incorporating brief spiritual reflections alongside scientific activities. However, these implications should be interpreted cautiously, given the limited scope of the study. This research was conducted in one class with a single teacher and a relatively short observation period. Consequently, it does not capture long-term character development, which is inherently a gradual and continuous process. Future studies are recommended to involve larger and more diverse samples, as well as longitudinal designs, to better understand the sustained impact of integrating religious character and curiosity in science education.

CONCLUSION

This study concludes that teachers play a strategic role in developing students' religious character and curiosity through values-based and contextual physics instruction. Through a reflective and integrative learning approach, teachers are able to instill spiritual awareness in students by linking physics concepts to the greatness of God. Religious values are not only integrated into the learning materials but also actualized in learning activities such as lesson introductions, class discussions, and attitude-based evaluations. Thus, physics learning becomes a vehicle for fostering students' faith and scientific morality. Furthermore, this study found that physics teachers play a crucial role in fostering students' scientific curiosity through active, exploratory, and question-based learning strategies. Students are encouraged to ask questions, observe, experiment, and seek solutions to various physical phenomena around them. An open and enjoyable classroom atmosphere makes students feel safe to express their opinions and experiment, further developing their curiosity about science. The integration of religious values and curiosity into a unified learning process makes physics learning more meaningful, balancing spiritual and rational aspects. Overall, this study confirms that character-based science education can produce a holistic learning experience, not only developing cognitive abilities but also shaping students' moral and scientific character. Teachers' success in managing values-based learning is a key factor in creating a classroom climate that supports the growth of students' spiritual awareness and scientific curiosity. Recommendations are made to expand the scope of research to various school levels and use a mixed approach to obtain a more comprehensive picture of the

effectiveness of character-based science education in shaping students' scientific and religious personalities.

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