

INTEGRATING CHARACTER EDUCATION INTO SCIENCE LEARNING TO IMPROVE ACADEMIC ACHIEVEMENT AT SMA TELUK DALAM

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Abstract

This study aims to examine the impact of character education integration in science learning on improving students' academic achievement at SMA Negeri 1 Teluk Dalam. Character values such as honesty, responsibility, cooperation, and curiosity were embedded into every stage of the science learning process to foster positive attitudes and enhance scientific concept mastery. A qualitative research approach with a case study design was employed, using observation, interviews, and documentation for data collection. The findings indicate that consistent implementation of character education strategies significantly improves students' learning motivation, active engagement, and academic performance in science subjects. These results highlight the crucial role of teachers in selecting appropriate instructional models and designing lesson plans (RPP) that incorporate character education indicators. Furthermore, the study underscores the necessity of a supportive school environment to optimize the holistic implementation of character education. Thus, integrating character education into science learning not only enhances academic achievement but also nurtures a generation with strong character, prepared to face future challenges.

Keywords: *Character Education Integration; Science Learning; Academic Achievement; Character in Science Education*

Abstrak

Penelitian ini bertujuan untuk mengkaji pengaruh integrasi pendidikan karakter dalam pembelajaran sains terhadap peningkatan prestasi belajar siswa di SMA Negeri 1 Teluk Dalam. Pendidikan karakter yang meliputi nilai-nilai kejujuran, tanggung jawab, kerja sama, dan rasa ingin tahu diintegrasikan ke dalam setiap tahap pembelajaran sains untuk membentuk sikap positif sekaligus meningkatkan penguasaan konsep ilmiah. Metode penelitian yang digunakan adalah pendekatan kualitatif dengan desain studi kasus, melibatkan observasi, wawancara, dan dokumentasi sebagai teknik pengumpulan data. Hasil penelitian menunjukkan bahwa penerapan strategi integrasi pendidikan karakter secara konsisten mampu meningkatkan motivasi belajar, keterlibatan aktif siswa, dan prestasi akademik dalam mata pelajaran sains. Temuan ini mendukung pentingnya peran guru dalam memilih model pembelajaran yang tepat dan menyusun RPP yang mengandung indikator pendidikan karakter. Selain itu, penelitian ini menegaskan perlunya dukungan lingkungan sekolah yang kondusif untuk mengoptimalkan implementasi pendidikan karakter secara menyeluruh. Dengan demikian, integrasi pendidikan karakter dalam pembelajaran sains tidak hanya meningkatkan prestasi



belajar siswa, tetapi juga membentuk generasi muda yang berkarakter kuat dan siap menghadapi tantangan masa depan.

Kata Kunci: *Integrasi Pendidikan Karakter; Pembelajaran Sains; Prestasi Belajar; Pendidikan Karakter dalam Sains*

A. Introduction

Twenty-first-century education demands a holistic learning approach that prioritizes not only cognitive mastery but also the comprehensive development of student character. This is particularly crucial in light of increasingly complex global challenges that require a young generation equipped not only with intellectual acuity but also with strong moral and ethical foundations (Lickona, 2013). One subject with significant potential to foster character development while simultaneously enhancing academic achievement is science education.

Research in science education particularly in the disciplines of Physics, Biology, and Chemistry continues to evolve to improve both the quality of instruction and student performance. Physics, as a fundamental science concerned with the study of natural phenomena and their governing laws, has been at the forefront of efforts to develop learning methodologies that enhance students' conceptual understanding and critical thinking skills (Hidayat & Wulandari, 2019). Their findings indicate that an experimental-based learning approach significantly improves learning outcomes in Physics through students' active involvement in laboratory practices.

On the other hand, Biology, which focuses on living organisms and their interactions with the environment, has also become an important object of educational research particularly in the development of

instructional strategies that integrate character values and ecological awareness. According to Santoso and Utami (2020), the implementation of contextual learning models in Biology classrooms can foster students' sense of responsibility toward environmental conservation while simultaneously improving learning outcomes. Meanwhile, Chemistry, which deals with the structure and transformation of matter, has frequently been examined through the application of problem-based learning (PBL) methods to enhance students' problem-solving skills and conceptual understanding (Putri & Rahayu, 2021). Their study emphasizes that character education integration in Chemistry learning can cultivate discipline and honesty in conducting experiments.

Thus, research across these three science subjects not only focuses on enhancing academic achievement but also emphasizes the development of student character in alignment with the demands of 21st-century curricula and the formation of the "Profil Pelajar Pancasila" (Pancasila Student Profile). Science education requires not only critical and analytical thinking but also the consistent application of values such as honesty, responsibility, collaboration, and curiosity (Sadiman, 2018).

The integration of character education into science learning is a vital strategy to meet the demands of modern education (Harefa. D., 2021). Through this approach, science



education not only emphasizes the mastery of scientific concepts and skills but also instills essential moral values that are critical to students' personal development (Gaurifa & Harefa, 2024). Character education supports students in internalizing values such as honesty during data collection, responsibility in completing assignments, and discipline in adhering to scientific procedures (Laksana, 2021). Therefore, the integration of character education is expected to foster meaningful learning experiences and positively impact students' academic achievement.

In line with this, the *Kurikulum Merdeka* currently implemented in Indonesia prioritizes the development of the *Profil Pelajar Pancasila* (Pancasila Student Profile), which includes values such as faith, noble character, independence, critical thinking, creativity, collaboration, and global diversity (Ministry of Education and Culture, 2021). Thus, integrating character education into science learning is particularly relevant for cultivating students who are not only academically competent but also possess strong character aligned with Pancasila values.

Research by Sadia (2013) indicates that learning models such as inquiry learning, problem-based learning, and cooperative learning are effective in integrating character education into science instruction. These models enable students to engage in active and collaborative learning while developing values like honesty, responsibility, and cooperation. Furthermore, a study by Yulianti et al. (2020) reveals that the integration of character education in science lessons enhances students' scientific attitudes, including academic honesty and

learning discipline, which directly contribute to improved academic performance

Despite the growing emphasis on character education in national educational policies, several challenges remain in its practical implementation, particularly at SMA Negeri 1 Teluk Dalam. Preliminary observations reveal that although character values have been embedded in the school's vision and curriculum, a gap persists between the expected values and students' daily behavior (Hesti Anjani Wau, Darmawan Harefa, 2022). Academic performance in science subjects is also suboptimal, with many students failing to meet the Minimum Mastery Criteria (Kriteria Ketuntasan Minimal, or KKM). This suggests the need for a more holistic and integrated learning approach that can simultaneously develop both cognitive and affective domains (Nurhadi & Santoso, 2020).

Rustaman (2019) emphasizes that contextual approaches in science education are highly effective in fostering student character, as they link scientific content to real-life contexts. This connection not only encourages critical thinking and decision-making based on scientific facts and moral values but also enhances emotional engagement, thereby facilitating optimal character development (Mutiani & Faisal, 2020). Accordingly, the implementation of character education strategies through contextual approaches and active learning models such as Problem-Based Learning (PBL) at SMA Negeri 1 Teluk Dalam is expected to offer a viable solution for improving both academic performance and character formation.



Given these challenges and opportunities, it is crucial to conduct an in-depth study on the integration of character education in science instruction at SMA Negeri 1 Teluk Dalam. A comprehensive investigation is anticipated to yield an instructional model that not only boosts students' academic achievement but also promotes sustainable character development. This is especially important in preparing future generations to face the complex demands of the 21st century with a balanced combination of intellectual competence and moral integrity.

B. Research Methodology

This study employed a qualitative approach with a case study design aimed at exploring and understanding in depth the strategies for integrating character education into science learning at SMA Negeri 1 Teluk Dalam, and its impact on students' academic performance. The qualitative approach was chosen for its ability to provide flexibility for researchers to investigate context, processes, and interactions in the educational environment comprehensively (Creswell, 2014). A case study is deemed effective for examining complex phenomena within a specific unit of analysis, thereby producing rich and detailed insights into the integration practices of character education in science instruction (Yin, 2018).

1. Research Subjects and Location

The research subjects included science teachers, the school principal, and students at SMA Negeri 1 Teluk Dalam. Participants were selected using purposive sampling, a technique designed to identify informants who possess relevant knowledge and experience regarding the implementation of

character education in science instruction (Palinkas et al., 2015). The research site was selected based on the school's formal adoption of a character education policy, though challenges in its implementation still persist. Therefore, the location provides a contextually appropriate and representative setting for obtaining rich and valid data. By focusing on the lived experiences and perspectives of key educational stakeholders, this research aims to provide a holistic portrayal of how character values such as honesty, responsibility, and cooperation are embedded in science learning, and how these affect students' academic and affective development.

2. Data Collection Techniques

Data collection in this study utilized multiple qualitative techniques, namely in-depth interviews, participant observation, and documentation. In-depth interviews were conducted to explore the understanding, experiences, and perceptions of teachers and students regarding the strategies for integrating character education into science learning (Berg, 2009). These interviews provided insights into the intentional practices and perceived outcomes of character-based instruction. Participant observation was carried out during science learning activities to directly observe how teachers implement character values such as honesty, responsibility, and cooperation and how students respond within the learning environment (Angrosino, 2007). Observations allowed the researcher to capture contextual interactions and behavioral patterns that reflect character development. Furthermore, documentation analysis was performed to complement primary data (T Hidayat, A Fau,



2023). Documents such as lesson plans (RPP), syllabi, and activity records related to character education were reviewed to examine how character indicators are embedded in instructional design and implementation (Merriam, 1998). This triangulation of data sources ensures comprehensive understanding and data saturation.

3. Data Analysis Techniques

The data were analyzed using qualitative techniques consisting of data reduction, data display, and conclusion drawing or verification (Miles, Huberman, & Saldana, 2014). Data reduction was carried out by selecting and organizing relevant information that aligned with the study's focus. This stage was followed by data presentation in the form of descriptive and thematic narratives that reveal patterns and strategies of character education integration in science classes (Harefa, 2024). The final stage involved inductive conclusion drawing based on the interpreted data. To ensure the credibility and trustworthiness of the findings, techniques such as source triangulation and audit trails were employed. Triangulation enabled validation across different data sources, while audit trails allowed the researcher to reexamine the analytical path and interpretation process (Lincoln & Guba, 1985).

4. Validity and Reliability

To enhance the validity and reliability of the research, data triangulation was employed by combining data from interviews, observations, and documentation to obtain a more comprehensive and credible understanding of the phenomenon (Patton, 2015). This approach ensured that findings

were corroborated across multiple sources, reducing bias and increasing confidence in the results. Furthermore, member checking was conducted by seeking confirmation from informants regarding the accuracy of interview transcripts and data interpretations (Creswell & Miller, 2000). This process aimed to verify that the research outcomes accurately reflected the real conditions and experiences of the participants, thereby strengthening the trustworthiness of the study.

5. Relevant Studies on Research Methods in Character Education and Science Learning

According to Nasution and Prasetyo (2020), qualitative research with a case study design is highly appropriate for examining the implementation of character education in learning contexts because it allows an in-depth understanding of processes, challenges, and impacts. They emphasized that in-depth interviews and participant observations are essential for obtaining rich and authentic data regarding classroom practices. Additionally, Miles et al. (2014) highlighted that systematic qualitative data analysis facilitates researchers in producing valid and trustworthy findings by structuring and interpreting complex data effectively. Wahyuni and Santoso (2019) also supported the use of qualitative approaches to study the integration of character values in science education, emphasizing that learning processes can be understood as dynamic interactions involving both cognitive and affective domains of students simultaneously. They stressed that documentation such as lesson plans and syllabi serves as crucial evidence to assess the extent to which



character values are formally embedded within the curriculum.

By employing these comprehensive methods, this study is expected to provide a thorough and nuanced depiction of strategies for integrating character education into science learning, while offering practical recommendations for teachers and schools to improve students' academic achievement at SMA Negeri 1 Teluk Dalam.

C. Results and Discussion

Research Results

The study on the integration of character education into science learning at SMA Negeri 1 Teluk Dalam revealed that the implementation of character education strategies has a significant positive impact on students' academic achievement. Data collected through interviews with teachers and students, classroom observations, and analysis of instructional documents demonstrated that integrating core character values such as honesty, responsibility, cooperation, and curiosity successfully created a more conducive and meaningful learning environment (Mutolib et al., 2025).

Interviews with science teachers indicated that a systematic approach to embedding character values within the learning process effectively enhanced students' motivation. Teachers reported that students became more disciplined in following experimental procedures and more meticulous in recording data, reflecting an internalization of honesty and responsibility values. This aligns with the findings of Wahyuni and Santoso (2019), who emphasized that integrating character education into science learning strengthens not only the cognitive domain but also the

affective domain, enabling students to develop positive and ethical scientific attitudes (Wahyuni & Santoso, 2019)

Classroom observations during the learning process showed an increase in constructive interactions both between teachers and students and among peers. This finding is consistent with Johnson, Johnson, and Smith (2014), who argued that cooperative learning methods—such as group discussions and project work effectively enhance positive social interaction and active student engagement in learning. In the context of science education, these methods provide opportunities for students to collaborate in problem-solving and idea exchange, which not only deepens their understanding of scientific concepts but also cultivates social skills and character traits like responsibility and respect for others' opinions (Gillies, 2016).

Furthermore, the attitudes of mutual respect and cooperation that develop during group work contribute significantly to creating a harmonious and conducive learning environment. According to Slavin (2015), a positive learning atmosphere is a crucial factor in enhancing student motivation and academic achievement. In the context of SMA Negeri 1 Teluk Dalam, this observation reinforces evidence that the integration of character education through collaborative learning methods effectively supports both academic improvement and the development of positive social character. Thus, the use of group discussions and project-based learning in science education not only enhances students' academic capabilities but also cultivates social attitudes that underpin comprehensive learning



success. This instructional model is highly relevant for simultaneously fostering character and academic achievement in today's modern educational era. Supporting this, Sadia (2013) affirms that science learning employing cooperative and problem-based learning approaches is effective in building character as well as deepening scientific conceptual understanding (Sadia, 2013)

Document analysis of instructional plans such as lesson plans (RPP) and syllabi revealed that most teachers explicitly incorporate character education indicators in their lesson planning. For example, honesty is indicated in the collection of practical data, and responsibility is emphasized in group project assignments. This demonstrates teachers' commitment to realizing learning that is not solely academically oriented but also holistically develops students' character. Yusmarti (2017) emphasizes that integrating character values at every stage of learning from introduction, exploration, elaboration, to confirmation is essential to ensure meaningful and comprehensive learning experiences (Yusmarti, 2017).

Quantitatively, the results of daily quizzes and final semester exams indicated an increase in the average student scores following the implementation of character education integration in science learning. The class average improved from 68.5 (below the Minimum Competency Criteria) to 78.3, reflecting a significant enhancement in students' conceptual understanding of science. This improvement aligns with the findings of Nasution and Prasetyo (2020), who reported that a holistic learning approach combining cognitive and affective aspects can improve academic achievement

while fostering adaptive and ethical student character (Nasution & Prasetyo, 2020). Furthermore, students involved in character-based learning reported significant positive changes in attitudes, including increased self-confidence, heightened awareness of the importance of honesty in learning, and greater motivation to actively participate in classroom activities. These changes corroborate Lickona's (2013) assertion that character education plays a crucial role in shaping students' sustained positive attitudes and behaviors, such as confidence and integrity throughout the learning process (Lickona, 2013).

The enhancement of students' self-confidence not only contributes to their willingness to express opinions and ask questions but also strengthens their academic resilience. This is supported by Shoshani and Eldor's (2016) study, which found that character development through integrated education significantly improves students' psychological well-being and learning motivation. Additionally, an increased awareness of honesty encourages students to approach assignments with sincerity and value the learning process as a meaningful experience (Shoshani & Eldor, 2016).

Increased motivation was also evident through students' active participation during the learning process, which played a significant role in deepening conceptual understanding and improving academic achievement. Thus, the integration of character education in learning not only fosters moral values but also creates a dynamic and productive learning environment. This approach is highly relevant for implementation at SMA Negeri 1



Teluk Dalam to cultivate a generation of students who excel academically while possessing strong character. This finding indicates that science learning integrated with character education is successful not only in academic aspects but also in fostering students' emotional and social maturity. Research by Jamaluddin et al. (2024) emphasizes that through a scientific approach embedded with character values, students can internalize sustainable attitudes of honesty, discipline, and responsibility (Jamaluddin et al., 2024).

Overall, the research findings confirm that the integration of character education into science learning is an effective strategy to enhance students' academic achievement while simultaneously building strong character. This strategy addresses the challenges of 21st-century education, which demands not only academic intelligence but also high moral and ethical standards as essential preparations for students to face social and global life.

Discussion

The study on integrating character education in science learning at SMA Negeri 1 Teluk Dalam shows that embedding character values in the science learning process contributes positively to improving students' academic performance. These results underscore the importance of character education as an integral part of the learning process, especially in science subjects, which have great potential to shape character while also boosting students' academic outcomes. Integrating character values such as honesty, responsibility, cooperation, and curiosity in science learning not only enhances conceptual understanding

but also cultivates positive attitudes that support the learning process. This aligns with the theory proposed by Laksana (2021), which states that character education is a conscious and planned effort to instill moral values through a consistent learning process, thereby forming a well-rounded and competitive student personality (Laksana, 2021).

Furthermore, the integration of character education through a scientific approach in science learning strengthens students' critical and creative thinking processes. This approach encourages students to observe, question, reason, experiment, and communicate their findings honestly and responsibly. According to Jamaluddin et al. (2024), this strategy is effective in fostering honesty and discipline while simultaneously enhancing students' intellectual abilities (Jamaluddin et al., 2024). Thus, science learning integrated with character education can develop students who are not only academically intelligent but also emotionally and socially mature. The implementation of project-based and group work learning models, as observed in this study, supports the development of cooperative character and social responsibility. Students learn to appreciate their peers' opinions, contribute actively within groups, and take responsibility for their respective tasks. Sadia (2013) revealed that cooperative learning and problem-based learning models are effective in building character while deepening students' understanding of scientific concepts (Sadia, 2013). This indicates that learning methods which promote social interaction and



collaboration play a strategic role in character education.

However, this study also identified several challenges still faced in the implementation of character education at SMA Negeri 1 Teluk Dalam. One significant challenge is teachers' readiness to consistently integrate character values in every stage of the learning process. Some teachers remain focused primarily on cognitive aspects without explicitly embedding character values in lesson plans (RPP) and instructional delivery. This phenomenon aligns with findings by Wahyuni and Santoso (2019), who stated that character value integration in learning needs to be strengthened through training and mentoring for teachers so that character education becomes an inseparable part of the teaching and learning process (Wahyuni & Santoso, 2019).

Moreover, the success of character education integration heavily depends on a supportive school environment, including parental involvement and a conducive school culture. Nasution and Prasetyo (2020) emphasize that effective character development requires synergy among schools, families, and communities to create a holistic and sustainable learning ecosystem (Nasution & Prasetyo, 2020). Therefore, efforts to improve academic achievement through character education integration must involve multiple stakeholders to ensure more optimal and continuous outcomes. Overall, the findings underscore that integrating character education into science learning is a relevant and strategic approach to enhancing academic achievement while simultaneously shaping students' strong character. This is

particularly crucial given the demands of 21st-century education, which assess not only intellectual capabilities but also attitudes and behaviors as essential preparation for facing complex global challenges.

Consequently, recommendations for schools and teachers include strengthening teacher capacity through training on character education integration, developing more innovative and contextual learning models, and fostering a school culture that comprehensively supports character education. In doing so, SMA Negeri 1 Teluk Dalam can serve as a successful model for character education implementation with tangible impacts on improving student academic performance.

D. Conclusion

The study on the integration of character education in science learning at SMA Negeri 1 Teluk Dalam indicates that the consistent and structured implementation of character education strategies can significantly improve students' academic achievement. The integration of character values such as honesty, responsibility, cooperation, and curiosity not only enriches the cognitive aspects of science learning but also shapes students' attitudes and personalities, supporting the overall learning process. The findings affirm that character education is a deliberate effort to instill moral values through a consistently sustained learning process, thereby producing students with strong character. Moreover, the scientific approach that integrates character education at every stage of science learning has proven effective in enhancing students' critical and creative thinking skills while fostering



responsible and honest attitudes throughout the learning process.

The success of character education integration also depends on the active role of teachers as facilitators who can select appropriate learning models and develop character indicators within syllabi and lesson plans. This is supported by Sadia (2013), who emphasizes the importance of using participatory learning models such as inquiry learning and problem-based learning to optimize both character development and students' academic achievement. However, this study also identified several challenges, particularly regarding the consistency and understanding of teachers in integrating character values, as well as the need for stronger support from the school environment. Therefore, the integration of character education must be carried out systematically and supported by a synergy between the school, teachers, parents, and the community.

Recommendations

Based on the conclusions, several recommendations are proposed to enhance the effectiveness of integrating character education into science learning at SMA Negeri 1 Teluk Dalam, namely:

1. Teacher Competency Development

The school should regularly conduct training and workshops to improve teachers' understanding and skills in integrating character values at every stage of science learning. These trainings should include active learning techniques that support character development and assessments relevant to affective aspects.

2. Strengthening Character Curriculum

Character education integration should be explicitly reinforced within curriculum documents, syllabi, and lesson plans to provide teachers with clear guidelines for implementing character values. The development of measurable character indicators within science learning is also crucial.

3. Building a Supportive School Culture

The school needs to create a conducive learning environment that consistently supports the application of character values in both learning activities and extracurricular programs. The involvement of parents and the community should also be optimized to strengthen character education outside the school.

4. Development of Innovative Learning Models

Teachers are encouraged to adopt innovative learning models that emphasize collaboration, exploration, and reflection, allowing students to actively learn and naturally cultivate positive character traits through learning experiences.

With these steps, it is expected that the integration of character education in science learning at SMA Negeri 1 Teluk Dalam will be more effective and have a more significant impact on improving academic achievement and shaping students' character.

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