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Implementation of a STEM and Wasaka Character-Integrated Module to Internalize Wasaka Character

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Abstract: STEM Education (Science, Technology, Engineering, and Mathematics) plays a crucial role in elementary schools because it provides a strong foundation for students' skill development and understanding in science and technology. STEM education can help students develop critical thinking, problem-solving skills, and creativity from an early age This research aims to implement a STEM-integrated module infused with Wasaka character values to internalize the Wasaka character in students. The Wasaka character, comprising religiousness, resilience, responsibility, and independence, is vital for fostering holistic development. The study utilizes a one-group pre-test-post-test design with pre-test and post-test evaluations to measure the effectiveness of the module in enhancing character development. Data were collected through observations and questionnaires. The results indicate a significant improvement in the internalization of Wasaka character traits following the implementation of the module. The findings suggest that integrating STEM education with local cultural values can effectively contribute to character building. This study highlights the importance of culturally relevant education in shaping students' character.

Keywords: Learning Module; STEM; Wasaka Character.

Introduction

STEM Education (Science, Technology, Engineering, and Mathematics) plays a crucial role in elementary schools because it provides a strong foundation for students' skill development and understanding in science and technology. Besides improving academic skills, STEM can also boost students' cognitive development (Cheng, 2023), By preparing students to face future challenges, STEM education in elementary schools becomes a vital component in shaping young generations who are ready to face global complexities with relevant skills and understanding.

The integration of STEM education (Science, Technology, Engineering, and Mathematics) and character in the education curriculum remains a challenge that needs serious attention. Some studies emphasize the importance of incorporating religious values into modern curricula to shape superior character and essential social skills (Mewengkang, 2023; Suprayitno, 2024). However, research specifically focused on the analysis of STEM and character integration within the context of the Kurikulum Merdeka (*Freedom Curriculum*) is still limited (Mustoip,

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2023). Nevertheless, research findings indicate that the integration of Kurikulum Merdeka-based learning in elementary schools yields positive results with careful planning, technology implementation, and emphasis on character building according to Pancasila values (Pribadi, 2024). Other findings also indicate that the integration of character education in the national curriculum is considered important to enhance the quality of education (Kusumawati, 2024).

The acceleration of character education can also be achieved through the integration of local wisdom in Pancasila and Civic Education (PPKn) learning (Erlande, 2024). The principle of integration in school curriculum development emphasizes the importance of involving all stakeholders, both within the school environment and at the intersectoral level (Zakiyah, 2024). Studies also highlight the urgency of incorporating local wisdom values into the curriculum to produce students with excellent personalities (Mimin, 2023). The integration of character education is expected to shape students with better positive values (Syamsuriyanti, 2023).

Wasaka Character, derived from the motto "waja sampai kaputing" in South Kalimantan, is very important to be instilled in education because it reflects strong local values such as hard work, perseverance, and commitment to achieving goals (Fitriah, 2024). In the context of education, instilling the Wasaka character not only helps students understand and appreciate their cultural heritage but also encourages them to internalize the attitudes and values needed for academic success and daily life (Annisa, 2024). Therefore, instilling the Wasaka character is an important step in shaping a generation that is not only academically intelligent but also has strong moral and ethical commitment. This research aims to answer how the implementation of a STEM and Wasaka character integrated module can be effective in internalizing Wasaka character in students and what impact this integration has on students' moral development.

Method

The research methodology used in this study is a one-group pre-test-post-test design. The sampling technique employed is convenience sampling, which involves selecting samples based on the availability of elements and ease of access. The research subjects consist of 35 fifth-grade elementary school students.

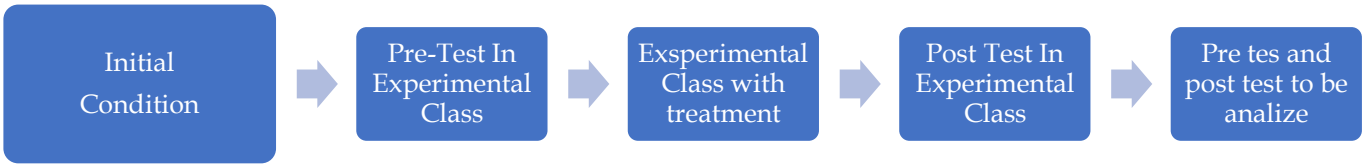

Figure 1. Research Flow

The research instrument used in this study is a self-assessment sheet regarding Wasaka character. Data collection was conducted by administering a self-assessment questionnaire on Wasaka character to the students.

Result and Discussion

The implementation of the STEM-integrated learning module for fifth-grade elementary school students on Theme 8 was carried out over 18 sessions. At the end of the learning process in Sub-theme 3, students were given a character assessment questionnaire/self-assessment. The results of the self-assessment regarding Wasaka character are presented in Table 1.

The results of the students' self-assessment questionnaire on the Wasaka character showed a significant increase from the pre-test to the post-test, with scores on almost all character statements improving. For instance, the score on the statement "I try to solve problems on my own before asking the teacher" increased from 2.5 to 4.1, and "I am responsible for my school assignments" rose from 2.9 to 4.5. This improvement reflects a positive change in aspects of independence, responsibility, and student motivation after participating in the intervention.

Behaviorism theory explains that positive reinforcement can enhance desired behaviors. In this case, the score increase may be due to positive reinforcement received by students, such as praise or rewards, encouraging them to be more independent and responsible (Zahra, 2024). Meanwhile, Cognitive theory emphasizes the importance of mental processes in learning (Trimahmudi, 2024). The increase in scores on statements related to understanding the material and the ability to overcome challenges suggests that students may have processed and organized information better, thanks to a learning approach that helped them understand and internalize the Wasaka character.

Table 1. Students' Self-Assessment Questionnaire on Wasaka Character

Statement	Pre	Post
I try to solve problems on my own before asking the teacher	2.5	4.1
I independently try to understand the lessons taught	2.7	3.9
I always need help from others to complete school assignments	2.6	3.8
I am brave enough to take the initiative and act independently in learning	2.7	4
I have the ability to overcome obstacles and challenges in learning	2.9	4
I often have difficulty controlling myself and managing time to complete school assignments	2.7	4.1
I am responsible for my school assignments and other obligations	2.9	4.5
I have a low interest in learning and academic activities	2.5	4.7
I continue to learn and develop my knowledge about my religion	2.4	4.6
I can better understand the material if it is related to religion	2.5	3.5
I do not disturb friends of different religions when they are praying	2.6	4.5
I am committed to praying when starting and ending every activity	2.9	4.2
I feel joy and happiness when I can help others or do good deeds even if they are of a different religion	3.0	4.2
I believe that hard work and perseverance will help me achieve better results	2.9	4
I believe that I can overcome difficulties in learning and achieve my academic goals	3.0	4
I do not give up easily when facing difficulties in tasks or activities	2.6	4
I have a high fighting spirit and do not easily give up when facing obstacles	2.8	4.1
I feel happy and satisfied with the hard work I put in to achieve my goals	2.7	4.5
I feel happy and satisfied with the hard work I put in to achieve my goals	2.4	4.2
I have low self-confidence and feel incapable of facing challenging situations	2.8	4.2
I follow lessons in class with enthusiasm	2.9	4
I complete the assignments given by the teacher	2.8	4
I do not complete the assignments given by the teacher	3.1	4.1
I pay attention to the teacher when explaining the lesson material	2.6	4.1
I am happy when trusted to carry out important tasks at school	3.1	4.1
I feel proud when I successfully complete school tasks well	2.9	4.1
I understand the consequences if I do not complete school tasks	2.7	4.2
I use my time efficiently	3.0	4.2
I complete tasks as I please	2.5	4.2

From the perspective of Constructivism theory, these results indicate that students actively construct their understanding through learning experiences (Arafah, 2023). Social interaction and deep learning experiences may have helped them form character values more strongly. Social Psychology theory highlights the importance of the social environment in character development (Rafi, 2024), and the questionnaire results suggest that group interactions and support from the learning environment contributed to this positive development. Habituation theory explains that the repetition of positive behaviors through consistent practice can lead to automatic changes in students' habits (Sari, 2023). Finally, Cybernetics theory emphasizes the importance of continuous feedback in the learning process, and the increase in scores indicates that constructive feedback may have helped students adjust and continuously improve their character assessments (Fauziah, 2023). The data obtained were then calculated using SPSS 27 software. The results of the calculations using SPSS 27 are presented below. The normality test results are shown in Table 8.

Table 8. Normality Test of the Self-Assessment Questionnaire in the Field Trial Phase

		Unstandardized Residual
N		70
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.26617232
Most Extreme Differences	Absolute	.124
	Positive	.114
	Negative	-.124
Test Statistic		.124
Asymp. Sig. (2-tailed)		.010[c]

a. Test distribution is Normal.
b. Calculated from data.
c. Lilliefors Significance Correction.

Based on Table 8, the Asymp Sig 2-tailed value is 0.010, which is less than 0.05, indicating that the data is not normally distributed. The homogeneity test is presented in Table 9.

Table 9 Homogeneity Test of the Self-Assessment Questionnaire in the Field Trial Phase

Levene Statistic	df1	df2	Sig.
28.168	1	68	.000

Based on Table 9, the significance value is 0.000, which is less than 0.05, indicating that the data distribution is not homogeneous. Since the data is not normally distributed and not homogeneous, a non-parametric test, specifically the Wilcoxon test, is used. The results of the Wilcoxon test for comparing the pre-test and post-test scores after the treatment, calculated using SPSS 27, are presented in Table 10 below.

Table 10. Wilcoxon Test

		N	Mean Rank	Sum of Ranks
After - Before	Negative Ranks	0[a]	.00	.00
	Positive Ranks	35[b]	18.00	630.00
	Ties	0[c]		
	Total	35		

a. After < Before
b. After > Before
c. After = Before

	After - Before
Z	-5.162[b]
Asymp. Sig. (2-tailed)	.000

a. Wilcoxon Signed Ranks Test
b. Based on negative ranks.

Based on Table 10, the N value of 0 in the negative ranks indicates that there was no decrease from before to after the intervention, while the N value of 35 in the positive ranks shows that there was an increase for all 35 students from pre-test to post-test. The Ties value of 0 indicates that there were no identical scores between the pre-test and post-test. The asymptotic significance (2-tailed) value is 0.000, which is less than 0.05, indicating a significant difference in the mean scores between the pre-test and post-test. Overall, the analysis results demonstrate a significant difference between the two assessments, suggesting that the STEM-integrated learning module had a significant impact on students' character self-assessment.

The Wilcoxon test results, which show a Z value of -5.162 and a p-value of 0.000, confirm that there is a significant difference between the character assessments before and after the intervention. All 35 students showed improvement in their character assessment scores, with no decreases or ties. This indicates that the intervention was successful in enhancing the overall character assessment of the students.

In the context of Behaviorism theory, this consistent improvement can be explained by the positive reinforcement that students received during the intervention (Zahra, 2024). Rewards or praise may have encouraged students to enhance their positive behaviors. Cognitive theory is also relevant here, as the increase in scores suggests that students may have better understood and internalized character values through deep thinking and reflection during the intervention. This is in line with Brown (2024) who also stated that applying STEM can improve student attitudes in all dimensions. Research by Wirawan (2022) highlighted the effectiveness of local wisdom-based modules in shaping student character, but did not integrate the STEM approach.

The correlation between Lickona's theory, the PJBL and PBL learning approaches, and the findings in the field show that the three main components identified by Lickona - moral knowing, moral feeling, and moral action - can be internalized effectively through this approach. In the context of PJBL, students not only learn to understand moral values (moral knowing) through module materials but also feel the importance of these values (moral feeling) as they work together to complete projects. This process motivates them to take concrete actions that reflect these values (moral action).

The implementation of PJBL and PBL learning with the Wasaka module proved effective in internalizing moral character and performance character in accordance with Lickona's theory, with positive results in all stages of testing. These results support the conclusion that a holistic and contextual learning approach can significantly improve students' wasaka character.Meanwhile, Constructivist theory suggests that students construct knowledge through active experiences, supporting the idea that experiential-based interventions allow students to form a better understanding of character (Arafah, 2023). Social Psychology theory indicates that peer and teacher interactions during the intervention may have contributed to character development (Fauziah, 2023). Both Habitual and Cybernetic theories play a role, where repeated positive behaviors and continuous feedback may have helped students automatically apply the character values they learned.

Conclusion

In conclusion, this study demonstrates that the implementation of a STEM-integrated module with Wasaka character values is effective in enhancing the internalization of character among elementary school students. The module significantly fostered responsibility and independence, although further reinforcement is still needed in the areas of religiosity and resilience. These findings underscore the importance of a holistic educational approach that not only focuses on improving academic competence but also on shaping students' character in alignment with local values. The results of this study provide a valuable contribution to curriculum development aimed at producing students with both superior technical

competencies and strong character, in accordance with the culture and values upheld in the community.

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Author Contributions
For research articles with several authors, a short paragraph specifying their individual contributions must be provided. The following statements should be used "Conceptualization, AM, BD, HM, WA contributed to the data collection process, data processing, and article writing. MA, PT contributed to the data processing and article writing

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Conflicts of Interest
The authors declare no conflict of interest.

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