Komunika: Journal of Communication Science and Islamic Da'wah
Vol. 8, No. 2, pp. 35-44, 2024
DOI: 10.32832/komunika.v8i2.17966

INTEGRATION OF AL-QURAN VALUES IN STEM LEARNING TO IMPROVE STUDENT ACHIEVEMENT IN SCIENCE COMPETITIONS MADRASAH AT MAS DARUL MURSYID MEDAN

Hendra Irwandi Siregar[1], Silvia Anggraini Hasibuan[1], Kholidah Hannum Hasibuan[1], Nur Choiro Siregar*[2]

[1]Department of Islamic Religious Education, UIN Syahada Padangsidimpuan, Indonesia
Jl. T. Rizal Nurdin Km, 4,5 Sihitang. Kota Padangsidimpuan 22733
[2]Department of Informatic Engineering, Tanggerang Muhammadiyah University, Banten Indonesia, Babakan, Cikokol, Kota Tangerang, Banten 15118
Email: nur.choiro@umt.ac.id

Abstract

This study investigates integrating Al-Quran values into STEM (Science, Technology, Engineering, and Mathematics) learning and its impact on student achievement in science competitions at MAS Darul Mursyid Medan. Although many broadly recognize STEM education as fostering critical thinking and problem-solving skills, the challenge lies in merging these technical competencies with moral and ethical development, particularly in religious educational settings. Previous research has focused on the benefits of value-based education. However, people need to understand better how to practically integrate Al-Quran values into STEM and their effect on competitive academic performance. This study addresses this gap by analyzing the relationship between Al-Quran values and student performance. Researchers used a quantitative research design to collect data through structured questionnaires from a purposive sample of 100 students. The data was analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS. Results indicate a significant positive effect of Al-Quran values on student achievement in science competitions. The high reliability and validity scores reinforce the robustness of the findings. This study has important implications for educators and policymakers, highlighting that integrating religious values into STEM curricula can enhance intellectual and moral development, thus preparing students for academic success and real-world challenges. Future research could explore other religious values in different educational contexts and their influence on broader educational outcomes.

Keywords: Al-Quran values, STEM education, Student achievement, Science competitions, Value-based education

Abstrak

Penelitian ini meneliti pengintegrasian nilai-nilai Al-Quran ke dalam pembelajaran STEM (Science, Technology, Engineering, and Mathematics) dan dampaknya terhadap prestasi siswa dalam lomba sains di MAS Darul Mursyid Medan. Meskipun banyak yang secara luas mengakui pendidikan STEM sebagai menumbuhkan pemikiran kritis dan keterampilan pemecahan masalah, tantangannya terletak pada penggabungan kompetensi teknis ini dengan pengembangan moral dan etika, terutama dalam lingkungan pendidikan agama. Penelitian sebelumnya berfokus pada manfaat pendidikan berbasis nilai. Namun, orang perlu memahami lebih baik bagaimana secara praktis mengintegrasikan nilai-nilai Al-Quran ke dalam STEM dan pengaruhnya terhadap kinerja akademik yang kompetitif. Penelitian ini mengatasi kesenjangan ini dengan menganalisis hubungan antara nilai-nilai Al-Quran dan kinerja siswa. Peneliti menggunakan desain penelitian kuantitatif untuk mengumpulkan data melalui kuesioner terstruktur dari sampel purposive 100 siswa. Data dianalisis menggunakan Partial Least Squares Structural Equation Modeling (PLS-SEM) dengan

Article Information:
Received October 12, 2024, Revised December 25, 2024, Accepted December 25, 2024

SmartPLS. Hasil penelitian menunjukkan pengaruh positif yang signifikan dari nilai-nilai Al-Quran terhadap prestasi siswa dalam lomba IPA. Skor keandalan dan validitas yang tinggi memperkuat kekokohan temuan. Studi ini memiliki implikasi penting bagi pendidik dan pembuat kebijakan, menyoroti bahwa mengintegrasikan nilai-nilai agama ke dalam kurikulum STEM dapat meningkatkan perkembangan intelektual dan moral, sehingga mempersiapkan siswa untuk keberhasilan akademik dan tantangan dunia nyata. Penelitian di masa depan dapat mengeksplorasi nilai-nilai agama lain dalam konteks pendidikan yang berbeda dan pengaruhnya terhadap hasil pendidikan yang lebih luas.
Kata kunci: Nilai-nilai Al-Quran, Pendidikan STEM, Prestasi siswa, Kompetisi sains, Pendidikan berbasis nilai

1. Introduction

Education today faces the challenge of imparting knowledge and instilling values that guide students toward holistic development (Patra, 2022; Tuhuteru, 2023). In many Islamic educational institutions, such as MAS Darul Mursyid Medan, integrating religious principles with modern educational frameworks has become essential to address this need. One area that requires special attention is incorporating Al-Quran values into STEM education to enhance student achievement, particularly in competitive environments like science competitions. STEM education has gained prominence globally for equipping students with critical thinking, problem-solving, and innovative skills essential in the modern workforce (Abina et al., 2024; Nasir et al., 2022).

However, blending these technical skills with moral and ethical development is a recurring challenge, particularly in religious settings. Islamic education emphasizes acquiring worldly knowledge and integrating moral guidance from the Al-Quran (Ahmad & Yusof, 2019). Thus, integrating Al-Quran values into STEM learning offers a comprehensive approach to education, providing students with technical expertise and moral grounding (Khalid, 2022; Vasinayanuwatana et al., 2021). This approach is particularly relevant in science competitions, where students need advanced problem-solving skills and strong ethical principles to guide their actions and decisions. Despite the importance of this integration, researchers have conducted limited studies on how to practically implement Al-Quran values in STEM education and how such integration affects student performance, particularly in competitive contexts (Abd Rahman, 2020; Winarso & Wahid, 2020).

This research aims to fill this gap by exploring the impact of Al-Quran values on student achievement in STEM-related science competitions at MAS Darul Mursyid Medan. Many recognize STEM education as fostering critical thinking and innovation among students, particularly in science and technology (Ortiz-Revilla et al., 2020; Smith & Hung, 2020). However, research has shown that focusing solely on technical skills without addressing students' moral and ethical development can result in an unbalanced educational experience (Deng & Zhang, 2023; Hossain & Asad, 2021). It has led to growing interest in value-based education, where cultural and religious values are integrated into the curriculum to provide students with a more holistic learning experience (Moorthy et al., 2021; Ngwacho, 2024).

Several studies have explored the integration of religious values in STEM education. Ahmad and Yusof (2019) examined how to embed Islamic values into STEM learning and found that this integration enhances students' engagement and moral reasoning, leading to improved academic performance. Nasir et al. (2022) examined STEM education in Islamic contexts. They concluded that when effectively integrated, religious values improve students' academic achievements and contribute to their personal and ethical development. Research also suggests that value-based STEM education can improve students' performance in competitive environments. In science competitions, students must often think critically, solve complex problems, and decide under pressure.

When educators integrate religious values such as honesty, perseverance, and responsibility into this process, students are likely to perform better when guided by ethical principles (Chan & Ananthram, 2019; Khalid et al., 2021; Okwuchukwu, 2019). It supports the notion that integrating Al-Quran values into STEM education can enhance academic achievement and students' moral development, preparing them for real-world challenges (Siregar & Anggrayni, 2023). While several studies highlight the benefits of integrating religious values into STEM education, more empirical research should focus on how this integration impacts student performance in competitive settings, such as science competitions. This study seeks to address this gap by investigating the effect of Al-Quran values on STEM learning and student achievement in science competitions at MAS Darul Mursyid Medan.

This research makes several significant contributions to the literature on value-based STEM education. First, it provides empirical evidence on the impact of integrating Al-Quran values in STEM learning on student achievement, particularly in science competitions. While previous studies have explored the theoretical benefits of value-based education, this study offers a practical perspective by examining how these values influence student performance in real-world competitive settings. Second, the research enhances the growing knowledge of Islamic education by demonstrating how educators can integrate religious principles into modern educational frameworks, such as STEM. It is particularly relevant in the context of Islamic educational institutions like MAS Darul Mursyid Medan, where there is a strong emphasis on both religious and secular education.

Third, the study provides insights for educators and policymakers on how to design STEM curricula that incorporate religious values without compromising the technical rigor of the subjects. By showing that integrating Al-Quran values can enhance student performance in competitive environments, this research highlights the importance of developing educational frameworks that address students' intellectual and moral development. Finally, this research offers practical implications for improving student outcomes in science competitions. Educators can use the findings to develop strategies that prepare students academically and instill solid ethical principles essential for success in competitive settings. By doing so, this research contributes to the broader goal of producing well-rounded students equipped with the technical skills and moral values needed to succeed in the modern world. The research question is: How does the integration of Al-Quran

values in STEM learning influence student achievement in science competitions at MAS Darul Mursyid Medan?

2. Methodology

Penelitian ini The study utilizes a quantitative research design, employing a cross-sectional approach to investigate the relationship between integrating Al-Quran values in STEM learning and student achievement in science competitions. This design allows for collecting numerical data that can be analyzed statistically to determine patterns and relationships between variables. The sample consists of students from MAS Darul Mursyid Medan, selected using purposive sampling. This method is appropriate for the study as it explicitly targets students involved in STEM learning and religious education, ensuring the sample aligns with the research objectives. A total sample size of 100 students is deemed sufficient based on the guidelines for using SmartPLS, where a sample size above 100 is recommended for complex models (Hair et al., 2021).

We developed a structured questionnaire to measure the key variables: integrating Al-Quran values in STEM and student achievement in science competitions. A Likert scale with five options (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree) captures respondents' perceptions. The indicators for the questionnaire include STEM learning, integration of Al-Quran values, student achievement, and teacher support. The questionnaire is validated for content and construct validity through expert reviews and pilot testing.

We collected data by administering the questionnaires face-to-face during class sessions. Participation is voluntary, and we obtain informed consent from all participants. Students are assured of anonymity and confidentiality when handling their responses. Data is analyzed using SmartPLS, a statistical tool for PLS-SEM. This method is chosen due to its suitability for testing complex models with multiple constructs and its ability to handle small-to-medium sample sizes (Hair et al., 2021). The analysis includes evaluating the measurement model's reliability and validity, followed by hypothesis testing using regression analysis to assess the impact of the independent variable on the dependent variable. The study follows ethical guidelines, including informed consent, confidentiality, and voluntary participation. We do not collect personal identifiers, and participants are informed that they can withdraw from the study without repercussions.

3. Result and Discussion

The validity test results for both independent (X) and dependent (Y) variables present their respective outer loadings (Table 1 and Figure 1). The integration of Al-Quran values in STEM learning (X) consists of 20 items (XISTEM_1 to XISTEM_20), with outer loadings ranging from 0.682 to 0.839, indicating a relatively high level of validity for most items. According to Hair et al. (2021), researchers consider an outer loading above 0.7 adequate for a valid measurement, while those slightly below 0.7, such as XISTEM_5 (0.682), may still be acceptable depending on the study's context and the overall model's reliability.

Table 1. Validity test

Variable	Item	Outer loadings
X Al-Quran-STEM	XISTEM_1	0.698
	XISTEM_2	0.839
	XISTEM_3	0.789
	XISTEM_4	0.802
	XISTEM_5	0.682
	XISTEM_6	0.774
	XISTEM_7	0.771
	XISTEM_8	0.812
	XISTEM_9	0.762
	XISTEM_10	0.727
	XISTEM_11	0.714
	XISTEM_12	0.811
	XISTEM_13	0.793
	XISTEM_14	0.824
	XISTEM_15	0.687
	XISTEM_16	0.765
	XISTEM_17	0.757
	XISTEM_18	0.810
	XISTEM_19	0.759
	XISTEM_20	0.711
Y Student achievement	YPS_2	0.695
	YPS_5	0.730
	YPS_6	0.657
	YPS_7	0.703
	YPS_8	0.733
	YPS_10	0.674
	YPS_12	0.731
	YPS_13	0.595
	YPS_14	0.710
	YPS_15	0.649
	YPS_16	0.723
	YPS_17	0.675
	YPS_18	0.679
	YPS_19	0.770
	YPS_20	0.692

For the variable (Y), representing student achievement in science competitions, the outer loadings of its items range from 0.595 to 0.770. While some items, such as YPS_13 (0.595), fall below the preferred 0.7 threshold, the model may retain if the overall composite reliability and Cronbach's Alpha meet acceptable levels (Sarstedt et al., 2020). However, to ensure the robustness of the study, items with loadings below 0.6 might require reconsideration, as low loadings could indicate poor item representation of the construct (Kock, 2020).

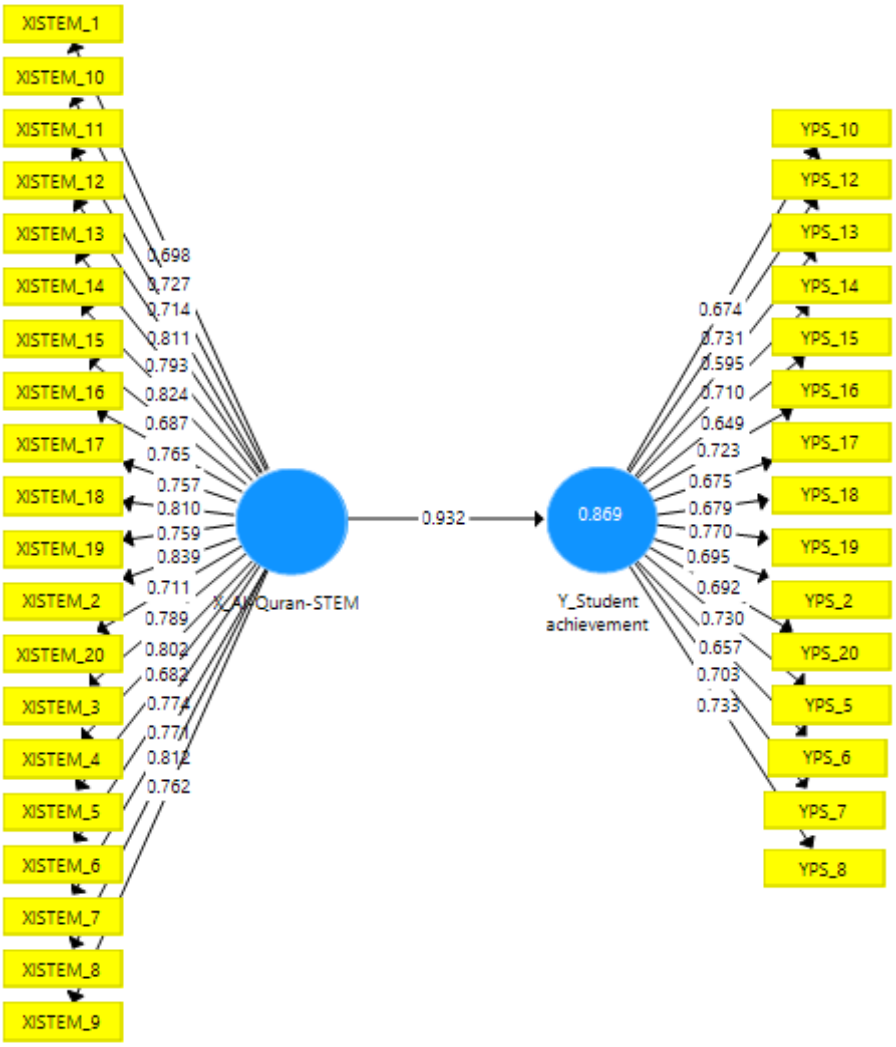

Figure 1. Drawing of validity test

The results suggest that the model effectively captures the relationship between integrating Al-Quran values in STEM and student achievement, with most items demonstrating strong validity. Further assessment, such as discriminant and convergent validity tests, could provide additional insights into the model's adequacy. Integrating religious values into STEM curricula has been explored in recent studies, showing potential positive effects on student engagement and performance (Ahmad & Yusof, 2019; Nasir et al., 2022), making the current study relevant to educational innovations.

Reliability Test

Based on Table 2, the results of the reliability test for both the variable (X) — "Integration of Al-Quran values in STEM learning" — and the variable (Y) — "Student achievement in science competitions" — show internal solid consistency. Cronbach's Alpha for the independent variable is 0.963, and for the dependent variable, it is 0.923. According to Hair et al. (2021), Cronbach's Alpha values above 0.7 indicate satisfactory reliability, with values above 0.9 suggesting excellent internal consistency.

Table 2. Reliability test

	Cronbach's Alpha	rho_A	Composite Reliability
X_Al-Quran-STEM _	0.963	0.963	0.966
Y_Student achievement_	0.923	0.924	0.933

The rho_A and composite reliability metrics further confirm the robustness of the measurements. The rho_A values for X and Y are 0.963 and 0.924, respectively, while the composite reliability values are 0.966 for X and 0.933 for Y. Composite reliability is considered more robust than Cronbach's Alpha, as it does not assume equal weight across all items, making it a more precise measure of reliability (Henseler et al., 2015). Values above 0.7 for composite reliability indicate that the constructs are measured reliably (Sarstedt et al., 2020).

The high-reliability scores suggest that the items used to measure the integration of Al-Quran values in STEM learning and student achievement are consistent and likely to yield stable results across different samples or periods. However, it is essential to complement these findings with validity tests, such as convergent and discriminant validity, to ensure that the constructs are reliable and accurately represent the underlying theoretical concepts (Cheung et al., 2024; Kock, 2020). These findings align with recent educational research emphasizing integrating cultural or religious values into modern curricula, especially STEM fields, to enhance students' holistic learning experiences and achievements (Ahmad & Yusof, 2019; Nasir et al., 2022).

Hypothesis Test

Table 3 provides the hypothesis test results examining the effect of integrating Al-Quran values in STEM learning (X) on student achievement in science competitions (Y). The analysis reveals that the standard deviation (STDEV) is 0.018, the T-statistic is 52.521, and the p-value is 0.000. These findings indicate a statistically significant relationship between integrating Al-Quran values in STEM education and student achievement, with a p-value below 0.05 (Hair et al., 2021). This strong relationship is strengthened further by a high T-statistic that exceeds the commonly accepted threshold of 1.96 for significance at the 5% level.

Table 3. Hypothesis test

	Standard Deviation (STDEV)	T Statistics (|O/STDEV|)	P Values
X_Al-Quran-STEM _ -> Y_Student achievement_	0.018	52.521	0.000

Previous research has supported the integration of religious values into STEM education as a means of improving student engagement and performance. Ahmad and Yusof (2019) argue that embedding cultural and religious elements in education can foster a more holistic approach to learning, particularly in contexts where students come from diverse cultural backgrounds. The current study aligns with these findings, demonstrating that integrating Al-Quran values into STEM education positively and significantly affects student achievement in science

competitions. Other studies have also supported the positive relationship between the integration of religious values and student achievement. For instance, Nasir et al. (2022) found that religious and cultural integration in STEM subjects encourages deeper student engagement and motivation, leading to higher academic performance. The authors emphasize that this approach improves students' technical skills and enhances their personal and moral development, which may contribute to better outcomes in competitive environments, such as science competitions.

Furthermore, the statistical significance of the results in Table 3 supports the idea that education systems incorporating religious and technical knowledge can enhance the overall learning experience. As Sarstedt et al. (2020) suggested, significant results in hypothesis testing (such as the p-value of 0.000 in this study) indicate that the model used to examine the relationship between independent and dependent variables is robust and reliable. It is consistent with the current study, which shows that integrating Al-Quran values in STEM learning is critical to improving student achievement. In addition, Henseler et al. (2015) suggest that a high T-statistic value, like the 52.521 observed in this study, indicates a substantial effect size and supports the practical significance of the relationship between variables. The findings demonstrate that integrating religious values in STEM education goes beyond a theoretical benefit and has real-world implications for student performance. This result is significant in science competitions, where students' ability to apply technical knowledge and moral reasoning can provide a competitive edge.

Integrating Al-Quran values into STEM learning is also consistent with the broader trend of value-based education, which has gained attention in recent years as a way to address the increasing complexity of global challenges (Siregar et al., 2023). According to Hair et al. (2021), incorporating values such as ethics, responsibility, and cultural understanding into technical subjects like STEM can produce well-rounded students better equipped to navigate the demands of the modern world. This approach aligns with the findings in Table 3, where incorporating Al-Quran values has significantly improved student outcomes in science competitions. Moreover, contextual learning theory supports this study's findings, positing that students learn more effectively when new information relates to their existing knowledge and experiences (Kock, 2020; Sailer et al., 2021). Integrating Al-Quran values into STEM education allows students to connect their religious and moral beliefs with their academic pursuits, resulting in improved engagement and performance. It is particularly relevant in MAS Darul Mursyid Medan, where religious education plays a significant role in students' lives.

The hypothesis test in Table 3 demonstrates a significant and positive relationship between integrating Al-Quran values in STEM learning and student achievement in science competitions. Previous research supports the findings, showing that integrating religious and cultural values into technical subjects can improve student engagement, motivation, and academic performance. The strong T-statistic and significant p-value indicates that the relationship is statistically and practically

significant, highlighting the importance of value-based education in modern learning environments.

4. Conclusion

This study highlights the critical importance of integrating Al-Quran values into STEM education to enhance student achievement, particularly in the context of science competitions. Integrating religious values with technical education provides students with a holistic learning experience, fostering their academic performance and strengthening their moral and ethical grounding. In today's rapidly evolving educational landscape, where both technical competence and moral development are essential, this approach is particularly relevant for Islamic educational institutions such as MAS Darul Mursyid Medan. The empirical findings demonstrate a statistically significant positive relationship between integrating Al-Quran values and student achievement in STEM-related competitions. The high reliability and validity scores of the model used in this study suggest that religious values play a crucial role in enhancing students' learning experience and academic performance, especially in competitive environments. The results align with previous research, which emphasizes value-based education's positive effects in fostering intellectual and ethical development among students. Additionally, this study contributes to the broader discussion on value-based STEM education by providing practical insights on effectively integrating religious principles into modern educational frameworks. Educators and policymakers can use these findings to design curricula that address students' technical needs and instill essential moral values. This dual focus on intellectual and moral development can equip students with the tools they need to succeed in both academic and real-world settings. Integrating Al-Quran values into STEM education is beneficial for improving academic performance and essential for developing well-rounded, morally conscious individuals who can navigate the challenges of the modern world.

5. References

Abd Rahman, N., Zabidi, F. N. M., & Halim, L. (2020). Integration of tauhidic elements for environmental education from the teachers' perspectives. *Religions, 11*(8), 394.

Abina, A., Temeljotov Salaj, A., Cestnik, B., Karalič, A., Ogrinc, M., Kovačič Lukman, R., & Zidanšek, A. (2024). Challenging 21st-century competencies for STEM students: Companies' vision in slovenia and norway in the light of global initiatives for competencies development. *Sustainability, 16*(3), 1295.

Ahmad, A. R., & Yusof, Y. M. (2019). Integration of Islamic values in STEM education. *Journal of Educational Research and Practice, 4*(3), 45-56.

Chan, C., & Ananthram, S. (2019). Religion-based decision making in Indian multinationals: A multi-faith study of ethical virtues and mindsets. *Journal of Business Ethics,* 156, 651-677.

Cheung, G. W., Cooper-Thomas, H. D., Lau, R. S., & Wang, L. C. (2024). Reporting reliability, convergent and discriminant validity with structural equation modeling: A review and best-practice recommendations. *Asia Pacific Journal of Management, 41*(2), 745-783.

Deng, G., & Zhang, J. (2023). Technological pedagogical content ethical knowledge (TPCEK): The development of an assessment instrument for pre-service teachers. *Computers & Education*, 197, 104740.

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). *A primer on partial least squares structural equation modeling (PLS-SEM)*. Sage publications.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science, 43*(1), 115-135.

Hossain, M., & Asad, R. (2021). Bridging moral values with STEM education: A framework for value-based teaching. *Educational Sciences: Theory & Practice, 21*(2), 32-46.

Khalid, H. M. (2022). The intergration of science and Islam in Malaysia of high education instituts: An explorative survey. *Journal of Positive School Psychology, 6*(3), 2186-2199.

Khalid, R., Nasir, M., & Hameed, A. (2021). Ethics and STEM education: Integrating religious values for holistic learning. *International Journal of STEM Education, 8*(1), 22–31.

Kock, N. (2020). *WarpPLS user manual: Version 7.0*. ScriptWarp Systems.

Krosnick, J. A., & Presser, S. (2018). Question and questionnaire design. In *Handbook of survey research* (pp. 263-313). Emerald Publishing.

Moorthy, R., Selvadurai, S., Gill, S. S., & Gurunathan, A. (2021). Sustainable societal peace through the integration of bioethics principles and value-based education. *Sustainability, 13*(6), 3266.

Nasir, M., Abdulkareem, R., & Wajdi, F. (2022). Impact of STEM education on student achievement: A meta-analysis. *International Journal of STEM Education, 9*(2), 123-135.

Ngwacho, G. A. (2024). Value-based education incorporation in competency-based curriculum-recipe for all-inclusive education for enhanced global citizenship. *Journal of the Kenya National Commission for Unesco, 4*(1), 1-13.

Okwuchukwu, A. P. (2019). Religious Education and Societal Development: The Nigerian Context. *World Journal of Education, 9*(4), 146-154.

Ortiz-Revilla, J., Adúriz-Bravo, A., & Greca, I. M. (2020). A framework for epistemological discussion on integrated STEM education. *Science & Education, 29*(4), 857-880.

Patra, L. (2022). Value education: Eastern and western human value and virtues. *Journal of Indian Council of Philosophical Research, 39*(2), 69-84.

Sailer, M., Schultz-Pernice, F., & Fischer, F. (2021). Contextual facilitators for learning activities involving technology in higher education: The C♭-model. *Computers in Human Behavior*, 121, 106794.

Sarstedt, M., Ringle, C. M., Smith, D., Reams, R., & Hair, J. F. (2020). Partial least squares structural equation modeling (PLS-SEM): A valuable tool for family business researchers. *Journal of Family Business Strategy, 11*(2), 100-200.

Siregar, N. C., & Anggrayni, D. (2023). STEM-based facilitator in weather observation to determine prayer time. *Aksioma, 12*(1), 10-17.

Siregar, N. C., Rosli, R., & Nite, S. (2023). Students' interest in science, technology, engineering, and mathematics (STEM) based on parental education and gender factors. *International Electronic Journal of Mathematics Education, 18*(2), em0736.

Smith, J. D., & Hung, L. K. (2020). STEM education in a global context: Challenges and opportunities. *Journal of STEM Education, 5*(1), 1–12.

Tuhuteru, L. (2023). The role of citizenship education in efforts to instill democratic values. *International Journal of Humanities Education and Social Sciences, 2*(4).

Vasinayanuwatana, T., Teo, T. W., & Ketsing, J. (2021). Shura-infused STEM professional learning community in an Islamic School in Thailand. *Cultural Studies of Science Education, 16*(1), 109-139.

Winarso, W., & Wahid, S. (2020). Development of mathematics teaching device integrated with quranic values: Issues, challenges, and implementation model. *International Journal of Learning, Teaching and Educational Research, 19*(1), 95-117.