

The Effects of Qur'an-Based Differentiated Mathematics Instruction on Academic Achievement and Religious Character: The Role of Students' Learning Styles at MAN 2 Wonosobo

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Received: 03-08-2025

Revised: 24-09-2025

Accepted: 13-10-2025

KEYWORDS

Qur'an-Based Differentiated Mathematics Instruction, Learning Styles, Academic Achievement, Religious Character.

ABSTRACT

This study aimed to analyze: (1) the effect of Qur'an-based differentiated mathematics instruction on students' academic achievement and religious character; (2) the effect of learning styles on students' academic achievement and religious character; and (3) the interaction between Qur'an-based differentiated mathematics instruction and learning styles in influencing students' academic achievement and religious character. This study employed a quantitative approach with a factorial design. The population consisted of Grade X students at MAN 2 Wonosobo. Using simple random sampling, 69 students from four randomly selected classes were included in the sample. The experimental classes received Qur'an-based differentiated mathematics instruction adapted to students' learning styles, whereas the control classes received conventional instruction. Data were collected through an academic achievement test and a religious character questionnaire and were analyzed using two-way ANOVA with SPSS 25. The findings showed that: (1) Qur'an-based differentiated mathematics instruction had a significant effect on students' academic achievement and religious character; (2) students' learning styles significantly affected academic achievement and religious character; and (3) a significant interaction existed between Qur'an-based differentiated mathematics instruction and learning styles in relation to academic achievement and religious character. These findings indicate that Qur'an-based differentiated mathematics instruction tailored to students' learning styles is effective in improving academic outcomes and fostering religious character. The study provides practical implications for teachers to implement differentiated instructional strategies grounded in Qur'anic values on a sustained basis and for schools to support the development of instructional models responsive to students' learning styles.

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Introduction

Every student has a distinctive way of learning. Some students understand information more easily through listening (auditory), others through images or graphical visualization (visual), and still others through direct experience or physical movement (kinesthetic). These differences in learning styles require instructional approaches capable of accommodating

learner diversity so that all students can achieve optimal learning outcomes (Aziz et al., 2022).

In practice, however, many educational institutions continue to employ uniform teaching approaches dominated by lectures and verbal delivery. Such approaches tend to benefit students with an auditory learning preference but may be less suitable for visual and kinesthetic learners. Consequently, some students experience difficulty understanding subject matter, particularly mathematics, which requires a high level of conceptual understanding (Supit et al., 2023).

Research has shown that when instructional approaches are aligned with students' learning styles, student engagement and learning outcomes improve significantly (Sulistiyowati et al., 2021). Visual learners, for example, benefit from diagrams and graphs, whereas kinesthetic learners understand concepts more effectively through direct practice. This highlights the urgency of implementing differentiated instruction in heterogeneous classrooms (Suwandi et al., 2023).

Furthermore, mathematics instruction in Islamic educational settings should not focus solely on cognitive achievement; it should also serve as a means of character formation through the internalization of Islamic values. Values such as honesty, responsibility, and discipline can be embedded in mathematics learning, for example through honest problem solving and timely completion of tasks (Imamuddin & Isnaniah, 2023).

Unfortunately, the integration of Islamic values into mathematics instruction has not yet been implemented optimally. Islamic values are often taught separately in Islamic Religious Education courses, causing students to miss opportunities to recognize the relationship between religious teachings and everyday life, including mathematics learning (Nurjanah, 2021). This lack of integration deprives the learning process of the spiritual dimension that should characterize Islamic education.

This problem is compounded by limited training and instructional resources that can assist teachers in integrating Islamic values into general subjects. Many teachers experience difficulty connecting abstract mathematical concepts with Islamic values in contextual and relevant ways (Uliah et al., 2020). Even when integration is attempted, its implementation is often sporadic rather than systematic (Ghani, 2023).

Qur'an-based mathematics instruction has considerable potential to foster holistic understanding, enabling students not only to excel academically but also to develop strong moral and spiritual foundations (Fitrah & Kusnadi, 2022). When students understand that mathematical concepts can reflect values such as justice, balance, and honesty as taught in the Qur'an, learning becomes more meaningful.

Accordingly, differentiated mathematics instruction that integrates Islamic values while taking students' learning styles into account constitutes a relevant and adaptive solution in contemporary education, particularly in madrasahs. This strategy can simultaneously improve cognitive learning outcomes and strengthen students' religious character (Gusteti & Neviyarni, 2022).

Against this background, the present study was designed to examine the effectiveness of Qur'an-based differentiated mathematics instruction in relation to students' learning styles. The study is expected to contribute theoretically and practically to improving the quality of Islamic education, particularly by promoting adaptive, integrative, and meaningful learning processes.

Research Methods

This study employed a quantitative approach using a quasi-experimental design to examine the effects of Qur'an-based differentiated mathematics instruction and students' learning styles on academic achievement and religious character. A 2×3 factorial design was used to test two independent variables— instructional model (implemented versus not implemented) and learning style (visual, auditory, and kinesthetic)—against two dependent variables, namely mathematics achievement and religious character. The study was conducted at MAN 2 Wonosobo and involved Grade X students in the 2024/2025 academic year. The sample was randomly selected and grouped according to learning style.

Data were collected using three principal instruments. A mathematics achievement test was administered before and after the intervention to measure students' conceptual understanding and learning outcomes. A learning-style questionnaire was used to identify students' learning modality preferences based on the VAK model, while a religious-character observation sheet assessed honesty, discipline, and responsibility during the learning process. All instruments were validated by experts, and their reliability was examined using Cronbach's alpha and inter-rater reliability procedures to ensure consistency of measurement.

The data were analyzed using two-way ANOVA to test the main effects of each independent variable and their interaction effects on the dependent variables. Normality and homogeneity tests were conducted as prerequisite analyses. Where significant differences were identified, post hoc tests were used to determine which groups differed significantly. Through these procedures, the study sought to provide a comprehensive account of the effectiveness of Qur'an-based differentiated instruction in improving students' academic achievement and religious character across different learning styles.

Literature Review

Differentiated instruction is a pedagogical approach that emphasizes meeting students' individual learning needs based on their unique characteristics. According to Tomlinson, differentiation can be implemented by modifying content, process, and product according to students' readiness, interests, and learning profiles. In mathematics education, this approach is considered capable of improving instructional effectiveness, particularly in classrooms characterized by diverse learning styles (Subban, 2006). Gusteti and Neviyarni (2022) further emphasize that differentiated strategies are highly relevant to the implementation of the Merdeka Curriculum, which promotes interactive, flexible, and student-centered learning.

Suwandi et al. (2023) classify differentiated instructional strategies into three principal forms: content differentiation, process differentiation, and product differentiation. Such adjustments are essential because students differ in ability, interest, and learning style. Differentiated instruction therefore offers a practical means of accommodating diversity so that learning can become more equitable, meaningful, and effective.

Within Islamic education, mathematics learning should not be oriented exclusively toward cognitive development but should also integrate spiritual values such as honesty, responsibility, and discipline. Ulia et al. (2020) demonstrated that mathematics teaching materials incorporating Islamic values can improve students' religious attitudes. Similarly, Imamuddin and Isnaniah (2023) argue that Qur'an-based learning can contribute to holistic personality development by strengthening faith, moral character, and rational thinking skills.

Learning style is another important factor influencing educational success. The VARK model—Visual, Auditory, Read/Write, and Kinesthetic—is widely used to identify students' learning preferences. Aziz et al. (2022) and Supit et al. (2023) explain that each learning style has distinctive characteristics and requires different instructional strategies. Visual learners tend to understand information through images and graphs, auditory learners through oral explanations, and kinesthetic learners through physical activities and direct practice. Teachers therefore need to design varied approaches to ensure that students can understand learning materials through modes that correspond to their preferences.

The integration of differentiated instruction and Qur'an-based learning is increasingly relevant within Islamic education. Ghani (2023) argues that the differentiation paradigm in the implementation of the Merdeka Curriculum, particularly in Islamic Religious Education, addresses not only students' cognitive development but also their affective and spiritual dimensions. By combining differentiated strategies with Islamic values, teachers can simultaneously accommodate diverse learning styles and foster religious character and noble conduct.

These arguments are reinforced by Sulistyowati et al. (2021), who found that meeting learning needs on the basis of learning styles contributes to improved mathematical literacy, particularly among kinesthetic learners. Instructional strategies that consider both learning

styles and Islamic values may therefore contribute to stronger academic outcomes while cultivating religious attitudes consistent with the mission of Islamic education.

Theoretically, this study rests on three principal foundations: Tomlinson's concept of differentiated instruction, the VARK learning-style framework (Aziz et al., 2022), and the Qur'an-based learning approach (Imamuddin & Isnaniah, 2023). Together, these perspectives provide a strong conceptual framework for understanding how instructional strategies influence academic achievement and the development of students' religious character.

Results and Discussion

1. Results

This study examined the effects of Qur'an-based differentiated mathematics instruction and learning styles on students' academic achievement and religious character at MAN 2 Wonosobo. Two-way ANOVA produced three principal findings.

First, Qur'an-based differentiated mathematics instruction had a significant effect on academic achievement ($p = .027 < .05$) and on students' religious character ($p = .002 < .05$). These results indicate that directly integrating Qur'anic values into mathematics instruction can improve academic outcomes while meaningfully fostering students' religious character.

Second, learning style had a significant effect on academic achievement ($p = .047$) and religious character ($p = .002$). This finding suggests that instruction adapted to visual, auditory, and kinesthetic learning preferences is more effective in improving learning outcomes and the internalization of religious values. Visual and kinesthetic learners demonstrated greater improvement than auditory learners.

Third, a significant interaction was found between Qur'an-based differentiated instruction and students' learning styles for both academic achievement ($p = .047$) and religious character ($p = .041$). Thus, instructional effectiveness can be optimized when teaching approaches are aligned with students' learning styles and enriched with spiritual values derived from the Qur'an.

2. Discussion

The findings demonstrate that Qur'an-based differentiated mathematics instruction significantly affected students' academic achievement. The ANOVA significance value of $p = .027$ indicates that students in the experimental group achieved higher average mathematics scores than those in the control group. This improvement suggests that combining differentiated instructional principles with Islamic values can optimize students' understanding of mathematical content.

Theoretically, differentiated instruction enables students to learn according to their readiness, interests, and learning styles. When this model is combined with Qur'anic values such as order and harmony (Qur'an 67:3-4), honesty (Qur'an 2:42), and responsibility (Qur'an 33:72), students can experience cognitive development while simultaneously internalizing moral and spiritual messages (Imamuddin & Isnaniah, 2023). The findings therefore reinforce the importance of connecting scientific knowledge with religion.

The mean post-test achievement score of the experimental group was 86.37, compared with 80.63 in the control group. This difference indicates that mathematics content presented through a religiously meaningful approach and adapted to students' individual needs can enhance engagement and motivation (Fitrah & Kusnadi, 2022).

Beyond cognitive outcomes, Qur'an-based differentiated mathematics instruction also significantly influenced students' religious character ($p = .002$). The mean religious-character score was 87.93 in the experimental group and 81.63 in the control group. Integrating Islamic values into an exact discipline such as mathematics can encourage students to recognize the spiritual meaning of logical order and computational accuracy, thereby strengthening awareness of honesty and responsibility in everyday life. This result is consistent with Ulia et

al. (2020), who found that mathematics teaching materials grounded in Islamic values can strengthen religious attitudes and moral commitment.

Differentiated instruction also creates a conducive space for the internalization of Qur'anic values because it gives teachers flexibility in selecting content and methods suited to student characteristics. Teachers may, for example, incorporate relevant Qur'anic verses into mathematical problem solving, use case studies based on Islamic ethics, or design projects emphasizing moral conduct and integrity (Ghani, 2023). Such strategies make learning more contextual and educationally holistic.

Student engagement in learning that incorporates both academic content and spiritual values contributes to the development of self-awareness and religious behavior. This approach not only responds to curricular demands but also supports the mission of Islamic education to integrate cognitive, affective, and psychomotor development harmoniously (Nurjanah, 2021). Mathematics learning therefore becomes not merely a process of transmitting concepts but also a medium for communicating values.

These findings are consistent with Gusteti and Neviyarni (2022), who show that differentiated instruction within the Merdeka Curriculum supports inclusive and personalized learning. When complemented by Qur'anic values, learning becomes more meaningful because academic and spiritual dimensions are addressed in a balanced manner. Qur'an-based differentiated mathematics instruction can thus be understood as a concrete form of holistic and integrative education.

The study further found that students' learning styles significantly influenced mathematics achievement and religious character. ANOVA yielded $p = .047$ for academic achievement and $p = .002$ for religious character. Thus, visual, auditory, and kinesthetic preferences significantly shaped students' success in understanding mathematics and internalizing religious values.

Visual and kinesthetic learners tended to achieve higher academic outcomes than auditory learners. Mean post-test scores were 87.92 for visual learners, 86.00 for kinesthetic learners, and 83.67 for auditory learners. These differences indicate that instructional approaches using visual representation and concrete activity may be particularly effective for communicating abstract mathematical concepts.

The VAK framework explains that individuals differ in their preferred modes of receiving and processing information. Visual learners benefit from images, graphs, and visual representations, whereas kinesthetic learners learn more effectively through direct experience and physical activity (Aziz et al., 2022). In abstract subjects such as mathematics, visual aids and activity-based approaches can therefore facilitate deeper conceptual understanding.

Learning styles also influenced religious character. Kinesthetic learners obtained the highest mean religious-character score (88.17), followed by visual learners (85.75) and auditory learners (82.67). This suggests that learning environments involving active participation, group discussion, simulation, and practical activities may strengthen discipline, honesty, and responsibility.

This result is consistent with Sulistyowati et al. (2021), who reported a strong relationship between kinesthetic learning and mathematical literacy because kinesthetic learners more readily understand concepts through direct activity. Supit et al. (2023) similarly found that visual and auditory learning styles influence learning outcomes, although each requires a different mode of instructional delivery. Educational success is therefore strongly affected by the alignment between teaching methods and students' learning preferences.

In Islamic education, adapting the communication of Islamic values to students' learning styles may also enhance the internalization of those values. Kinesthetic learners, for example, may understand honesty and responsibility more deeply through simulations of muamalah practices or participation in Qur'an-based social projects, while visual learners may benefit from visual representations of Qur'anic verses and moral values.

The integration of learning styles into Qur'an-based differentiated instruction provides students with personalized and meaningful learning experiences. Teachers act as facilitators who design strategies responsive to students' preferences and learning needs while consistently embedding spiritual values. This is consistent with Ghani's (2023) argument that

the Merdeka Curriculum, when synergized with Islamic values, should remain responsive to the diversity of learner characteristics.

Table 1. Mean Academic Achievement and Religious Character Scores by Learning Style

Learning Style	Mean Academic Achievement	Mean Religious Character
Visual	87.92	85.75
Auditory	83.67	82.67
Kinesthetic	86.00	88.17
Significance	$p = .047$	$p = .002$

The analysis also revealed a significant interaction between Qur'an-based differentiated mathematics instruction and students' learning styles for mathematics achievement ($p = .047$) and religious character ($p = .041$). This confirms that instructional effectiveness depends substantially on the fit between the instructional strategy and students' learning characteristics. Qur'an-based instruction produces stronger outcomes when implemented through strategies aligned with the ways students learn.

Students with a kinesthetic learning style who participated in Qur'an-based differentiated instruction achieved the highest academic and religious-character outcomes, with mean scores of 89.25 and 90.00, respectively. In contrast, auditory learners who did not receive the differentiated model obtained the lowest outcomes. These results indicate that interactive, concrete, and activity-based learning is particularly compatible with kinesthetic learners who rely on direct experience.

The interaction between the two independent variables reinforces the proposition that no single instructional approach is equally appropriate for all students. As explained by Tomlinson (cited in Subban, 2006), differentiated instruction seeks to provide learning experiences adapted to student profiles. When this principle is combined with Qur'anic values containing moral and spiritual messages, instruction can address both cognitive and affective dimensions.

The findings also underscore the importance of teacher flexibility in implementing adaptive and contextual strategies. Visual learners may require graphical media or diagrams incorporating relevant Qur'anic verses; auditory learners may benefit from oral explanation emphasizing honesty and responsibility; and kinesthetic learners may internalize values more effectively through simulation, direct practice, or action-based projects.

This interaction reflects the principle of integrating intellect and spirituality. When students learn mathematics not only through rational logic but also through spiritual values communicated in ways suited to their learning preferences, the learning process becomes more meaningful. This supports Imamuddin and Isnaniah's (2023) conclusion that mathematics instruction grounded in Islamic values can simultaneously foster religious character and improve conceptual understanding.

Accordingly, combining differentiated instruction with Qur'anic integration constitutes an effective and relevant strategy for value-based contemporary education. It is consistent with the holistic conception of Islamic education, which integrates intellectual development (tafaqquh), spirituality (taqwa), and morality (akhlaq). Education is therefore directed not merely toward examination performance but also toward developing students' social and religious awareness and responsibility.

The interaction effects have important implications for educational practice in madrasahs and Islamic schools. A flexible curriculum, teachers who understand students' learning styles, and instructional materials grounded in Islamic values are three essential elements that should be integrated to create transformative learning. These findings reinforce the urgency of strengthening teachers' competence in designing contextual and comprehensive differentiated instruction based on religious values.

Overall, the study contributes not only to the development of effective instructional

strategies but also to a broader paradigm of Islamic education that is responsive to contemporary psychopedagogical developments. In a rapidly changing world marked by moral challenges, Qur'an-based education that remains responsive to individual learning needs is essential for developing intellectually capable and morally grounded generations.

Table 2. Interaction Effects of Instructional Model and Learning Style

Variable Interaction	Significance (p)	Interpretation
Instruction × Learning Style → Academic Achievement	0.047	Significant
Instruction × Learning Style → Religious Character	0.041	Significant
Highest Achievement (Experimental × Kinesthetic)	89.25	Optimal combined effect
Highest Religious Character (Experimental × Kinesthetic)	90.00	Optimal combined effect

Conclusion

Based on the data analysis, three conclusions can be drawn. First, Qur'an-based differentiated mathematics instruction significantly affects students' mathematics achievement and religious character. This indicates that integrating Qur'anic values into instruction can improve academic achievement while positively fostering students' spiritual character.

Second, students' learning styles—visual, auditory, and kinesthetic—have significant effects on mathematics achievement and religious character. Differences in how students receive and process information are therefore important factors influencing both academic success and character development in school.

Third, a significant interaction exists between Qur'an-based differentiated mathematics instruction and students' learning styles in relation to mathematics achievement and religious character. The effectiveness of the instructional model is therefore maximized when it is adapted to each student's learning style. An appropriate combination of spiritually relevant teaching strategies and responsiveness to learning preferences produces a stronger effect on optimal learning outcomes.

Recommendations

Teachers are encouraged to implement differentiated mathematics instruction integrated with Qur'anic values because this approach has been shown to improve both academic achievement and religious character. Teachers should also proactively identify students' dominant learning styles—visual, auditory, or kinesthetic—so that instructional methods, media, and assessment can be adapted appropriately.

Schools and educational institutions should support the implementation of differentiated instruction by providing professional development, training, and workshops on effective differentiated teaching practices. Institutions should also provide resources and facilities that enable teachers to vary instructional methods according to students' learning styles and thereby maximize both academic and non-academic potential.

Future studies should involve larger samples and other subject areas to examine the generalizability of the findings. Additional variables that may interact with this instructional model, such as learning motivation and family environment, should also be investigated to develop a more comprehensive understanding.

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