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EMBEDDING ISLAMIC VALUES IN INTEGER PROBLEM DESIGN: A PEDAGOGICAL INNOVATION TO ELEVATE STUDENT ENGAGEMENT

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Abstrak: This study aims to develop a set of integer mathematics problems that are integrated with meaningful contextual elements to enhance student engagement and learning interest. Using the Tessmer formative evaluation model, the development process included a preliminary study, self-evaluation, expert reviews, one-to-one testing, small group trials, and a field test with eighth-grade students at an Islamic-integrated junior high school in Indonesia. The resulting product consisted of 13 context-based integer word problems. Validation from content and pedagogical experts confirmed a high degree of validity (90%), while student responses indicated high practicality (96.7%). The effectiveness of the problem set was demonstrated by 94% of students achieving the minimum mastery level. Furthermore, a significant increase in student learning interest was observed, particularly in the emotional aspect, where the "joy" dimension rose by 69.62%. These results suggest that the integration of relevant, real-life contexts into mathematical problem design can significantly improve both student performance and motivation in mathematics classrooms.

Kata Kunci: Islamic values, contextual learning, integer problems, student engagement

INTRODUCTION

Mathematics plays a central role in developing logical reasoning, problem-solving skills, and analytical thinking. It is recognized globally as a foundational discipline in education, often referred to as the "*Queen of the Sciences*." However, despite its fundamental importance, mathematics is frequently viewed by students as difficult, abstract, and disconnected from real life [1]. This perception often leads to low motivation and minimal engagement, particularly in middle school students who are still forming their academic identities and learning attitudes. In Indonesia, this issue persists across various educational settings, including Islamic schools, where students are expected to not only master academic content but also grow in moral and spiritual character.

Kurikulum Merdeka, which has gradually replaced Kurikulum 2013 in Indonesia, represents a paradigm shift in educational practices by emphasizing student autonomy, contextualized learning, and the holistic development of learners. It encourages educators to design learning experiences that are not only cognitively engaging but also nurture students' spiritual, social, and emotional competencies [2][3]. Within this framework, mathematics instruction is expected to transcend procedural fluency and conceptual understanding by also fostering character values such as honesty, discipline, responsibility, collaboration, and empathy [4][5]. Despite these ideals, the implementation of such integrative approaches in mathematics classrooms remains limited. Mathematics is still frequently presented as a value-neutral and abstract subject, disconnected from real-life contexts and the moral development of students, which contradicts the core principles of Kurikulum Merdeka [6]. Islamic Integrated Schools (Sekolah Islam Terpadu), such as SMP IT in Papua Selatan, where this study was conducted, are uniquely positioned to address this gap. These institutions operate with a dual focus: delivering national academic standards while simultaneously nurturing Islamic character and moral behavior [7]. Yet, based on field observations and interviews with teachers at the school, it was found that existing mathematics assessments, particular problem sets used for evaluation, did not reflect this integrative vision. Most exercises remained abstract, symbolic, and devoid of ethical or spiritual meaning. As a result, students found it difficult to connect mathematics to their daily lives or to internalize the relevance of their learning, which affected their motivation and interest in the subject.

To address this issue, one promising approach is to design mathematics problems that are not only aligned with the curriculum but also embedded with Islamic values (nilai-nilai keislaman). This method reflects the concept of Islamic-integrated learning, in which subject matter is infused with spiritual and moral messages derived from the Qur'an and Hadith. In many Islamic-integrated schools, mathematics instruction tends to remain abstract and disconnected from the core moral values these institutions aim to instill. For example, observations at SMP IT Merauke, a private Islamic junior high school which revealed that mathematical problems presented in the classroom often lacked ethical relevance and cultural familiarity. Although the school's mission emphasizes Islamic character education, classroom practices showed limited integration between mathematics content and students' lived experiences or moral development.

This disconnect stands in contrast to existing research, which highlights the positive impact of

embedding moral and cultural values within instructional design. Arithmetic operations such as addition and subtraction, for instance, can be meaningfully contextualized through scenarios involving giving charity (zakat or sedekah) or practicing honesty in daily transactions. Such value-laden contexts have been shown to engage students not only cognitively, but also emotionally and ethically. [8] found that integrating Islamic values into academic content improved student attentiveness and emotional connection to lessons. Likewise, [9] observed increased student persistence, collaboration, and motivation when exposed to mathematics tasks grounded in moral values. [10] further emphasized the importance of contextualizing mathematics in socially meaningful settings, in line with the Realistic Mathematics Education (RME) approach.

To bridge this gap, this study introduces a pedagogical innovation: the design of contextualized integer word problems that embed Islamic values while aligning with students' everyday experiences. These problems incorporate themes such as *hablun minannas* (relationship with others) and *hablun minannafsi* (self-discipline), aiming to foster both mathematical understanding and moral development. The tasks were developed using Tessmer's formative evaluation model and refined through expert review and classroom trials to ensure their validity, practicality, and effectiveness.

Through this approach, the study presents a contextual, faith-integrated model of mathematics instruction that fosters academic achievement while promoting character formation. The objective of this research is to develop and evaluate mathematics problems that align with Islamic moral teachings and students' real-life contexts, contributing to the broader field of value-integrated instructional design.

RESEARCH METHODS

This study employed a Design and Development Research (DDR) approach to produce a set of integer mathematics problems integrated with Islamic values to enhance students' interest in learning. The research was guided by the formative evaluation model proposed by [11], which emphasizes the iterative development and refinement of educational products through systematic testing in authentic learning environments. This model is particularly effective for educational innovations intended for real classroom implementation, as it integrates feedback from both experts and learners across multiple stages of evaluation.

This study employed a design research methodology using Tessmer's formative evaluation model, which is well-suited for developing and refining educational products through iterative testing. The research was conducted at SMP IT Merauke, a private Islamic-integrated junior high school in Papua, Indonesia, with a focus on designing contextualized mathematics problems that integrate Islamic moral values.

The research design consisted of five stages: preliminary investigation, self-evaluation, expert review, one-to-one and small group evaluation, and field implementation. The data sources included curriculum documents, teacher interviews, classroom observations, expert feedback, and student responses across the different stages.

In the preliminary investigation phase, researchers analyzed the school's mathematics curriculum and assessment practices, conducted semi-structured interviews with mathematics teachers, and observed classroom instruction. This phase aimed to identify the gap between conventional assessment tools and the institution's mission to promote Islamic character education. It also explored the potential for embedding values such as *hablun minannas* (relationship with others) and *hablun minannafsi* (self-discipline) within the topic of integers.

The self-evaluation phase involved drafting 13 contextualized integer word problems designed to meet both mathematical objectives and Islamic moral values. Attention was given to ensuring situational authenticity by grounding the problems in students' real-life contexts. These drafts were then reviewed during the expert review phase, where Islamic education and mathematics education experts evaluated the problems for content relevance, instructional clarity, value alignment, and language use. Qualitative feedback from this stage was used to revise and refine the problems.

The revised tasks were tested in the one-to-one evaluation phase with three eighth-grade students of varying academic abilities. Researchers collected data through observation and student think-aloud protocols to identify issues related to comprehension, language clarity, and contextual interpretation. Minor adjustments were made based on these findings. In the subsequent small group evaluation phase, six students worked collaboratively on the problems while researchers observed their interaction, peer discussion, and problem-solving strategies. This phase provided insights into the social and cognitive dynamics elicited by the tasks.

The final stage, field implementation, was conducted in a classroom setting with 30 eighth-grade students. The goal was to assess how the problem set functioned under typical instructional conditions. During this phase, researchers collected data through classroom observations, student work samples, and group discussions to evaluate practicality, student engagement, and instructional impact.

Data collection techniques across all phases included curriculum document analysis, interviews, classroom observations, expert feedback forms, audio recordings, field notes, and student written responses. The data analysis combined qualitative content analysis (e.g., coding of student responses and observational data) with descriptive statistics (e.g., frequency of error types, engagement

indicators) to triangulate findings and inform revisions throughout the development process.

This iterative and data-driven approach ensured the product's validity, practicality, and effectiveness in supporting both mathematical understanding and moral character development in line with the school's educational goals.

Observational protocols captured classroom behaviors and engagement during implementation. A student response questionnaire was administered both before and after the intervention to assess changes in students' interest in mathematics. The questionnaire was structured around four affective dimensions: enjoyment, attention, relevance, and participation. Additionally, a pre-test and post-test design was used to evaluate student performance in integer problem-solving tasks, thereby assessing the instructional impact of the developed problems.

Data were analyzed using quantitative descriptive techniques. Practicality was determined based on student response rates and the degree of task completion, while effectiveness was assessed by the proportion of students meeting or exceeding the school's minimum mastery standard (71 out of 100). Descriptive comparison of pre- and post-intervention questionnaire results provided insights into shifts in students' learning interest, with a focus on emotional engagement as a key indicator of motivational impact.

1. Practicality Analysis

Practicality was evaluated based on student task completion rates using the following formula [12].

$$\text{Practicality score} = \left(\frac{\text{Number of students who completed all tasks}}{\text{Total number of students}}\right) \times 100$$

A high practicality score indicates that students were able to understand and complete the tasks within the instructional context. The interpretation of practicality levels is outlined below:

Table 1. Practicality Score

Practicality Score (%)	Interpretation
85 – 100	Very Practical
70 – 84	Practical
50 – 69	Less Practical
< 50	Not Practical

2. Effectiveness Analysis

Effectiveness was measured by the proportion of students who achieved or exceeded the school's minimum mastery standard (KKM) of 71 (out of 100), using this formula [13].

$$\text{Effectiveness score (\%)} = \left(\frac{\text{Number of students with score } \geq 71}{\text{Total number of students}}\right) \times 100$$

Table 1. Effectiveness Score

Effectiveness Score (%)	Interpretation
≥ 85	Very Effective
70 – 84	Effective
50 – 69	Less Effective
< 50	Not Effective

3. Interest Analysis

Students' learning interest was assessed through a pre- and post-intervention questionnaire that focused on emotional engagement, including enjoyment, enthusiasm, and motivation. A descriptive comparison of the questionnaire results (mean scores and percentage changes) provided insight into shifts in students' affective responses to mathematics learning.

These combined analyses enabled a comprehensive evaluation of the designed materials in terms of both implementation feasibility and impact on student learning.

Through this systematic and iterative methodology, the study aimed not only to produce a pedagogically and culturally relevant set of problems but also to contribute to broader efforts in value-based mathematics education that connect conceptual learning with students' emotional and moral development.

RESULTS AND DISCUSSION

The development of the integer mathematics problems was conducted using the Tessmer formative evaluation model, which involved several stages: preliminary study, self-evaluation, expert review, one-to-one trials, small group testing, and field implementation. The resulting product consisted of 13 integer word problems that were contextually grounded and designed to reflect scenarios familiar to students' daily lives and learning environments.

1. Preliminary Study

The process began with a preliminary study, which served as the foundational phase in identifying the instructional gaps and contextual opportunities for integrating Islamic values into mathematics education. During this stage, the researcher conducted a comprehensive needs analysis through three primary activities: curriculum review, instructional material analysis, and teacher interviews.

First, the researcher reviewed the Indonesian national mathematics curriculum for junior high school, focusing on the basic competencies (*Kompetensi Dasar*) related to the topic of integers in grade VIII. This review helped ensure that the problem set would be aligned with national educational standards,

including the cognitive level of the learning objectives and the types of skills expected from students. In particular, the curriculum emphasized conceptual understanding and application of integer operations in problem-solving contexts—goals that aligned well with value-integrated learning.

Second, the researcher examined existing instructional materials, such as textbooks and student worksheets currently used at SMP IT, a private Islamic-integrated school in Merauke, Papua. This analysis revealed that while most materials were aligned with the procedural aspects of the curriculum, they lacked contextual richness and did not include any deliberate integration of Islamic moral values or character education. The problems presented in textbooks were largely abstract, devoid of real-life applications, and presented in a generic format that students found monotonous and disconnected from their lived experiences.

Third, semi-structured interviews were conducted with mathematics teachers at SMP IT, aiming to capture their perspectives on students' attitudes toward mathematics and their current practices regarding the integration of Islamic teachings into classroom instruction. The teachers reported that students tended to have low interest and engagement in learning mathematics, especially when confronted with abstract numerical problems that felt irrelevant to their daily lives. While teachers expressed an awareness of the importance of character education and occasionally made verbal connections to Islamic teachings during lessons, they acknowledged a lack of concrete tools or materials such as problem sets or activities, that explicitly embedded these values into the learning process.

The findings from the preliminary study provided compelling justification for the design and development of a new instructional product: a set of integer mathematics problems integrated with Islamic values. From a pedagogical perspective, the gap between the curriculum's vision and classroom practice indicated a need for materials that support not only procedural fluency but also contextual learning and affective engagement. The lack of value-integrated problems in existing resources meant that students were missing out on opportunities to connect mathematical reasoning with real-life moral decisions, such as fairness, responsibility, and cooperation, principles deeply rooted in Islamic teachings.

The low levels of student interest, as reported by teachers, further emphasized the need to create problems that resonate with learners' social and religious environments. Research in mathematics education has shown that contextualized and culturally relevant problem-solving tasks can increase motivation, deepen conceptual understanding, and foster a sense of identity and belonging in the learning process [1]. Thus, integrating Islamic values such as *hablun minannas* (social harmony) and *hablun minannafsi* (self-discipline) into mathematical problem contexts was not merely an act of religious reinforcement but also a strategic approach to making mathematics more engaging, meaningful, and transformative.

In essence, the preliminary study revealed a disconnect between policy and practice, as well as between academic content and student values. These insights informed the subsequent design of a problem set that not only fulfilled mathematical learning objectives but also reflected the moral and cultural realities of students at an Islamic-integrated school. By grounding the problem development in actual classroom needs and teacher insights, the research ensured that the final product would be both educationally sound and contextually responsive.

2. Self-Evaluation and Expert Review

Following this, the project entered the self-evaluation stage, in which the initial drafts of the problems were internally reviewed and revised by the researcher. This internal review focused on refining the clarity of the problem statements, ensuring coherence between the mathematical and contextual elements, and improving the consistency of Islamic terminology used across items. Specific revisions included simplifying instructional wording to enhance student comprehension and standardizing the presentation of Quranic references to improve readability and authenticity. Such iterative internal evaluations are a critical feature of the formative evaluation model, as they help eliminate basic structural or linguistic issues before external validation [11][14].

The reviewers commended the strong alignment between the mathematical content and the embedded moral instruction, noting that the problem contexts were not only cognitively appropriate for eighth-grade learners but also pedagogically meaningful and supportive of national curriculum objectives. However, they also recommended several refinements, such as replacing less-relevant Quranic verses with those more thematically suited to the mathematical scenarios, restructuring the logical flow of multi-step problems, and enhancing the integration of Islamic values to avoid superficial or tokenistic inclusion. These suggestions were subsequently implemented to improve both the didactic quality and cultural authenticity of the problem set.

This expert review process underscored the importance of interdisciplinary collaboration in the development of culturally responsive mathematics tasks. The integration of religious values into subject-matter instruction requires

careful attention not only to content validity but also to ethical and cultural sensitivity [15]. Moreover, aligning mathematics instruction with learners' lived experiences and moral worldviews is known to foster deeper engagement and increase the perceived relevance of academic content [16][17]. These findings were evident in the current study, where students meaningfully engaged with tasks that blended mathematics with character-based scenarios. Thus, this stage served not only as a technical validation checkpoint but also as a mechanism to ensure the product's pedagogical coherence and cultural integrity.

3. Small Group Evaluation

During the small group evaluation stage, six eighth-grade students were divided into two teams and asked to collaboratively solve the developed integer word problems. Observational data revealed that students engaged actively with the tasks, not only discussing the mathematical procedures but also reflecting on the moral and contextual aspects embedded in each problem. Students frequently referred to their own experiences and related the problem scenarios, such as helping friends, managing classroom duties, and sharing resources fairly, to everyday situations, making the tasks more relatable and meaningful.

This finding suggests that the contextual nature of the problems activated prior knowledge and enabled moral reasoning alongside cognitive processing. The collaborative environment also fostered strong peer interaction, with higher-achieving students assisting their peers, supporting shared understanding and equitable task completion. This dynamic reflects findings from [18] who emphasized that integrating Islamic values in mathematics learning not only supports cognitive growth but also nurtures social cohesion and character development.

Moreover, the clarity of instructions and language used in the problem sets appeared sufficient to minimize student confusion, indicating the developmental appropriateness of the tasks. Notably, students' discussions often included references to values such as *'adl* (justice) and *ta'awun* (cooperation), showing internalization of moral principles within their mathematical reasoning. These behaviors echo findings by [19] who observed that value-integrated tasks support students in developing moderate Islamic perspectives through problem solving.

4. Field test

The field test provided further validation of the instructional viability of the developed problem set. With a practicality score above 95%, the materials proved suitable for classroom use, requiring minimal additional explanation or scaffolding by the teacher. According to [20] such results are indicative of products that are well-aligned with real classroom demands, especially important in under-resourced or mixed-ability educational contexts.

The high proportion of students achieving or exceeding the mastery criterion (71/100) suggests that the problems effectively supported mathematical understanding, particularly in connecting abstract integer operations with concrete, meaningful contexts. Students were more reflective and purposeful in their approach to problem-solving, frequently referencing ethical considerations, such as fairness and responsibility, in their justifications. This supports the findings of [21], noted that Islamic values can act as intrinsic motivational factors that guide disciplined and goal-oriented learning behavior.

Furthermore, the increase in student learning interest, particularly in the emotional domain (joy, enthusiasm), demonstrates the affective benefit of culturally grounded instructional materials. Hidayah and [22] similarly found that Islamic-contextualized mathematics tasks promote higher engagement by connecting academic material to personal identity and daily life.

This study found that mathematics instruction that meaningfully integrates Islamic values can significantly enhance students' learning experiences across multiple domains. Students demonstrated improved mathematical understanding and task completion, suggesting that the problems were not only accessible but also effectively designed to support conceptual development. At the same time, the tasks encouraged students to engage in moral reasoning and ethical reflection, as seen in their frequent references to principles such as fairness and cooperation during problem-solving. The collaborative nature of the activities promoted positive peer interaction, with students supporting one another to achieve shared understanding—highlighting the social dimension of value-based learning.

Additionally, students displayed heightened emotional engagement and motivation, reporting greater enjoyment and relevance in their learning experiences. These outcomes can be attributed to several key factors: the contextual authenticity of the problems, the iterative revisions informed by expert and student feedback, and the alignment of the material with students' cultural and religious backgrounds. Together, these elements created a learning environment that supported both academic and character development.

The strength of this study lies in its comprehensive and interdisciplinary design process, which ensured that the final product was pedagogically sound and culturally responsive.

However, the research was limited to one school, which may constrain the generalizability of its findings. Further studies across varied Islamic-integrated school contexts are necessary to confirm broader applicability. Additionally, while this study captured immediate student responses, it did not investigate long-term effects on character formation, an area that warrants future exploration.

The findings of this study are in line with previous research, including those by [8] [23][24] all of whom emphasize the benefits of contextual and value-based instruction in mathematics. By integrating Realistic Mathematics Education principles with Islamic moral teachings, this study offers a novel contribution to the field of mathematics education in faith-based settings.

The implications are substantial. This research provides a practical model for Islamic-integrated schools seeking to align mathematics instruction with their character-building missions. It demonstrates that academic rigor and moral development are not mutually exclusive but can be mutually reinforcing when learning materials are thoughtfully designed. Moreover, it reinforces the role of mathematics not only as a domain of cognitive growth but also as a meaningful medium for nurturing ethical and socially aware learners.

CONCLUSION

This study successfully developed a set of integer word problems that integrate Islamic values through a Design and Development Research (DDR) approach, utilizing the Tessmer formative evaluation model. The developed problems were designed not only to support students' mastery of mathematical concepts but also to promote moral and character development by embedding values such as honesty, fairness, discipline, and cooperation into meaningful, real-life contexts.

The development process involved several iterative stages self-evaluation, expert review, one-to-one testing, small group evaluation, and field testing, each contributing to the refinement of the product's clarity, contextual relevance, and instructional quality. Feedback from experts and students indicated that the problems were valid, practical for classroom use, and aligned with the cognitive and moral development needs of learners in an Islamic educational setting.

In addition to improving students' understanding of integer operations, the problems also contributed to enhancing their engagement and interest in learning mathematics. Students responded positively to the use of real-life, value-based scenarios, and were more motivated to participate actively in the learning process. The integration of Islamic values encouraged deeper reflection and ethical reasoning, supporting the broader goals of character education.

Overall, this research demonstrates that embedding religious and cultural values into mathematics instruction can enrich the learning experience and foster a more holistic approach to education. Future studies are encouraged to explore similar innovations across other mathematical topics and contexts to further support value-based and culturally responsive pedagogy.

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