

Integrating islamic values into mathematics student worksheets: Validity study on exponents and radicals

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Abstract

Student worksheets are instructional materials designed to help learners grasp subject matter, foster interaction with teachers, and encourage active engagement in the learning process. In Islamic-based schools, the integration of religious values into instructional resources is essential to provide meaningful learning experiences that support both cognitive and moral development. However, existing mathematics worksheets often lack such integration. This study aims to design and validate mathematics worksheets on exponents and radicals that explicitly integrate Islamic values. The research employed a Research and Development (R&D) design using Plomp's development model, which consists of preliminary research, prototyping, and evaluation. The study, however, was limited to the prototyping and validation stages. Validation was conducted by three expert validators. The results revealed that the worksheets achieved an overall overall validity score of 90,50% from subject matter experts and 95,62% from instructional design experts, both categorized as very valid. These findings demonstrate that the integration of Islamic values into mathematics worksheets not only meets academic and design standards but also provides a meaningful approach to teaching mathematics that aligns with the spiritual and moral objectives of Islamic-based education.

Keywords: Exponents, Islamic integration, Radicals, Student worksheet, Validity

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INTRODUCTION

Student Worksheets in Indonesia called *Lembar Kerja Peserta Didik* (LKPD) serve as instructional resources that assist students in mastering content, enhance teacher–student interaction, and foster engagement and improved learning outcomes (Hikmah et al., 2023). Prastowo identifies four primary functions of LKPD: (1) to optimize student participation while reducing teacher dominance, (2) to facilitate students' comprehension of learning material, (3) to present concise yet task-rich content that strengthens understanding, and (4) to streamline the delivery of instruction (Kosasih et al., 2023). For LKPD to function effectively, Partasiwi et al. emphasize the need for systematic development by incorporating eight essential

components: title, learning instructions, core competencies or subject matter, time allocation, tools and materials, concise procedural guidance, tasks, and assessment (Hikmah et al., 2023).

In practice, LKPD encourage students to engage in structured and independent learning, while also providing variety in learning activities, thereby reducing boredom (Dari et al., 2024). In mathematics education, LKPD play a pivotal role in knowledge construction, fostering deeper conceptual understanding, and developing critical thinking skills (Syibli et al., 2021). Accordingly, the use of LKPD can serve as an effective medium for enhancing instructional quality and promoting active student participation.

Beyond cognitive benefits, LKPD can also serve as a vehicle for character and values education, particularly within Islamic education contexts. Norsati and Chairani argue that the adoption of instructional materials tailored to institutional context is essential, particularly in Islamic-based schools. Integrating Islamic values into learning materials not only reinforces Islamic identity but also nurtures students' morals and character (Sari et al., 2024). However, interviews conducted with two mathematics teachers across two classes at a Madrasah Tsanawiyah (MTs) in Pekanbaru revealed that the mathematics worksheets used had not yet incorporated Islamic values. In fact, embedding Islamic perspectives in LKPD is vital to encourage students to engage more actively in learning and to help them recognize the greatness of Allah SWT through mathematical concepts (Sari et al., 2024; Kosasih et al., 2023). Furthermore, integrating Islamic values in instruction has been shown to improve learning motivation while fostering discipline and responsibility among students (Halimah et al., 2024). Thus, the development of Islamic-integrated LKPD is expected to provide more meaningful learning experiences and enhance students' comprehension of both scientific knowledge and Islamic values (R. E. Sari et al., 2024).

Several studies have addressed the development of Islamic-integrated LKPD. For instance, (Halimah et al., 2024) examined the use of Islamic-integrated mathematics worksheet (LKPD) on learning outcomes for the topic of relations and functions; (Sari et al., 2024) developed an Islamic-context-based LKPD on ratio; and (Nurmilawati, 2023) designed a character-based Islamic LKPD for teaching fractions. (Amir et al., 2019) investigated the integration of Islamic and Minangkabau cultural values in an LKPD for systems of linear equations in three variables (SPLTV), while (Syibli et al., 2021) developed Islamic-integrated worksheets for social arithmetic.

Although several prior studies have contributed to the development of Islamic-integrated LKPD, research on exponents and radicals remains limited, even though these topics serve as

essential prerequisites for understanding advanced mathematical concepts such as exponential and logarithmic functions. Sukmana and Arhasy found that many students struggle with exponents, particularly in understanding concepts, applying them to problem-solving, and performing operations such as multiplication, division, addition, and subtraction of algebraic expressions (Sukmana & Arhasy, 2019). This highlights the need for LKPD that not only guide students in systematically understanding exponents and radicals but also integrate Islamic values to make learning more meaningful.

Therefore, while Islamic-integrated LKPD have been developed for topics such as ratios and functions, no validated product yet exists for exponents and radicals, which are foundational for developing higher-order mathematical thinking skills. Based on this urgency, the present study aims to examine the validity of Islamic-integrated mathematics worksheets (LKPD) on exponents and radicals to enhance students' conceptual understanding and character development.

METHOD

This research employed a Research and Development (R&D) approach using Plomp's (2013) development model, which comprised three primary stages: preliminary research, prototyping or product design, and evaluation (Sabrina & Rahardi, 2021). However, the evaluation phase was not conducted, as the study was limited to product validation. The following presents the two stages that were carried out.

1. Preliminary Research Stage

At this stage, an analysis of the LKPD that were currently used in schools was conducted to assess their alignment with Learning Outcomes and Learning Objectives in Phase D, as well as their effectiveness in enhancing student learning outcomes (Sari et al., 2022). In addition to LKPD, the textbooks used in schools were also examined to evaluate the consistency of content, instructional approaches, and presentation with the existing curriculum, as well as their potential as references for developing new products.

This analysis not only addressed cognitive aspects but also assessed the extent to which Islamic values were integrated into the learning process. Therefore, interviews with mathematics teachers were conducted to identify challenges in teaching exponents, such as limited teaching resources, lack of character integration, and minimal connections between mathematics instruction and Islamic values. The interviews also explored ways to embed Islamic principles more meaningfully into the teaching of exponents.

2. Prototyping Stage

This stage followed the initial analysis and served as the basis for designing the LKPD prototype. Information obtained from the LKPD and textbook review, as well as teacher interviews, was used to design a structured product enriched with Islamic values. The development process began with organizing the content on exponents and radicals according to curriculum requirements, emphasizing conceptual understanding and real-life applications. The material was then supplemented with Islamic values through problem contexts, illustrations, and narratives linking mathematical concepts with Islamic teachings.

LKPD Structure Design

The design aimed to produce a systematically organized LKPD that integrated Islamic values in a planned and meaningful way. The structure was developed by considering pedagogical approaches, content requirements, and the characteristics of Phase D students. The LKPD consisted of several main sections: cover page, foreword, table of contents, usage instructions, content presentation, and practice exercises. Each section was designed to support progressive mastery of exponents and radicals. Islamic values were integrated through motivational quotes, opening and closing prayers, and inspiring stories relevant to the topic.

Prototype Development

The prototype was developed as an initial product reflecting the planned design, intended to test the validity of its content, structure, and functionality. The prototype included the structured content on exponents and radicals, Islamic integration elements, practice problems, and supporting components. This version allowed for an initial evaluation of the LKPD's practicality and attractiveness to students.

Self-Evaluation

Once the prototype was prepared, a self-evaluation was carried out to identify errors, shortcomings, or inconsistencies in content, presentation, and layout (Sari et al., 2022). This reflective evaluation was guided by pedagogical principles, curricular alignment, and consistency in Islamic integration. Technical aspects, such as clarity of language, readability, and comprehensibility of instructions, were also considered. The results of this evaluation provided the basis for revisions prior to expert validation.

Expert Review

Expert validation was conducted to assess the quality and validity of the LKPD (Habibah & Suryelita, 2022). The validation process involved three experts consisting of one university lecturer and two mathematics teachers. Each validator evaluated the LKPD based on 68

statement items covering five main aspects: content alignment with learning outcomes and objectives, instructional design and presentation, language clarity and accuracy, visual design and layout, and the integration of Islamic values within the material and illustrations. The assessment used a five-point Likert scale, with categories 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. In addition to providing quantitative ratings, the validators also gave qualitative comments and suggestions to strengthen the evaluation results. The assessment data were presented in tabular form to facilitate analysis and interpretation.

The validity analysis was conducted by calculating the percentage score using (Riduwan, 2019) formula.

$$\text{Validity Percentage (\%)} = \frac{\text{Total Score Obtained}}{\text{Maximum Score}} \times 100 \quad (1)$$

This percentage was then used to determine the validity level of the LKPD based on the criteria shown in Table 1 (Riduwan, 2019).

Tabel 1. Validity Criteria

Description	Criteria
$81\% \leq V < 100\%$	Very Valid
$61\% < V \leq 80\%$	Valid
$41\% < V \leq 60\%$	Moderately Valid
$21\% < V \leq 40\%$	Less Valid
$0\% \leq V \leq 20\%$	InValid

RESULTS AND DISCUSSION

1. Preliminary Research Stage

The analysis indicated that, overall, the LKPD and textbooks currently in use were consistent with the Learning Objectives (LO) and Learning Outcomes (CP) for Phase D. The materials covered the required competencies and were logically organized in line with the existing curriculum structure. Nevertheless, several issues were noted regarding language and visualization. The language used in both the LKPD and textbooks tended to be formal and highly technical, making it less accessible to students' developmental levels and potentially hindering active engagement. Furthermore, the visual design—such as illustrations, images, and page layouts—was limited, reducing the materials' appeal and their ability to provide adequate visual support for understanding exponents and radicals.

Interviews with mathematics teachers revealed that the integration of Islamic values into instruction was minimal. In practice, such integration was limited to reciting opening and closing prayers at the beginning and end of lessons. No systematic efforts were made to connect

Islamic values to mathematical content, particularly in exponents and radicals. Teachers also indicated the absence of teaching resources or guidelines to support Islamic integration throughout the learning process. The discussions concluded that Islamic integration should extend beyond ritual practices to permeate the entire learning process, including the use of contextual problems relevant to Islamic values, character building through content, and embedding moral messages consistent with Islamic teachings.

2. Prototyping Stage

LKPD Structure Design

The development of Islamic-integrated mathematics worksheet (LKPD) on exponents and radicals aimed to support both teachers and students in creating meaningful learning experiences. The LKPD was designed not only to strengthen students' conceptual mastery of mathematics but also to embed Islamic values contextually into classroom activities. The systematic prototype development process is illustrated in the following figures.



Figure 1. Cover page, User guide, Instructional objectives, and integration of Islamic values in LKPD

The cover page included the LKPD title, relevant mathematical illustrations, education level, grade, semester, student name field, and authorship. It was designed with attractive color combinations to draw students' interest. The following pages contained detailed usage instructions, Instructional objectives for each session, opening prayers, and Islamic motivational quotes to foster a religious learning atmosphere. Islamic values were integrated throughout the content, linking mathematical concepts with spiritual and moral development.

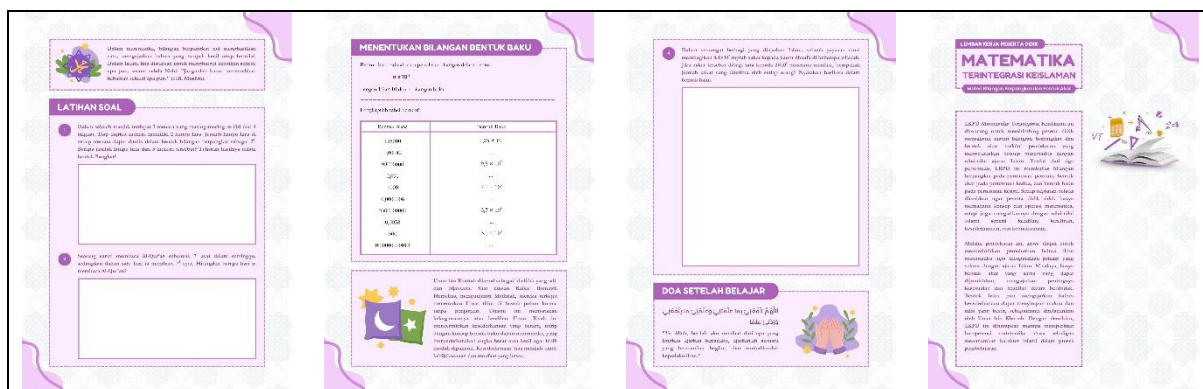


Figure 2. Practice exercises, Islamic stories, closing prayers, and back cover

This section presented practice questions framed in Islamic contexts, allowing students to apply mathematical knowledge while reinforcing Islamic values. The pages also featured inspirational Islamic stories relevant to exponents, providing moral and ethical connections alongside conceptual understanding. A closing prayer was included at the end of each session, followed by the LKPD's back cover.

Self-Evaluation

During the self-evaluation stage, the prototype was reviewed for clarity, accuracy, and consistency in both content and design. Improvements included correcting typographical errors, enhancing readability, restructuring content for better coherence, and refining the visual layout—particularly the cover and graphical elements—to make the LKPD more engaging.



Figure 3. Results of self-evaluation

The revised cover was updated with institutional logos (UIN Sultan Syarif Kasim Riau, Tut Wuri Handayani, and Kurikulum Merdeka), page numbering, and a concept map. The back cover layout was also redesigned. These refinements aimed to improve completeness, readability, and attractiveness.

Expert Review

Validation of the Islamic-integrated mathematics worksheet (LKPD) on exponents and radicals was conducted by subject matter experts and instructional design experts. The subject matter experts evaluated aspects of content validity, presentation, language, and the integration of Islamic values, while the instructional design experts focused on graphical validity and Islamic integration. The validation process involved one university lecturer and two mathematics teachers as validators. The results of the validation by subject matter experts are presented in Table 2.

Table 2. Validation Results by Subject matter experts

Component	Indicator	Score	Max Score	Validity (%)	Category
Content validity	Alignment with LO and CP	41	45	91,11	Very Valid
	Content accuracy	55	60	91,67	Very Valid
	Supporting material	109	120	90,83	Very Valid
	Presentation technique	41	45	91,11	Very Valid
Presentation validity	Instructional presentation	28	30	93,33	Very Valid
	Completeness of presentation	37	45	82,22	Very Valid
Language validity	Suitability with students' developmental level	27	30	90	Very Valid
	Communicativeness	27	30	90	Very Valid
	Coherence and logical flow	29	30	96,67	Very Valid
Islamic Integration	Integration of Islamic values	54	60	90	Very Valid
Total		448	495	90,50	
Overall average validity score (%)				90,50	Very Valid

Subsequently, the validation conducted by the instructional design experts also resulted in an assessment within the *very valid* category. The recap of the calculations in Table 3.

Table 3. Validation Results by Instructional Technology Expert

Component	Indicator	Score	Max Score	Validity (%)	Category
Visual design validity	LKPD Size	28	30	93,33	Very Valid
	Cover	175	180	97,22	Very Valid
	Internal layout design	244	255	95,69	Very Valid
Islamic Integration	Integration of Islamic Values	55	60	91,67	Very Valid
Total		502	525	95,62	Very Valid
Overall average validity score (%)				95,62	Very Valid

Based on the validation results conducted by the subject matter experts, a total score of 448 out of 495 was obtained, with an overall average validity score of 90,50%. This percentage falls within the very valid category, indicating that the Islamic-integrated mathematics worksheet (LKPD) on exponents is suitable for use as a learning instrument. In detail, the content validity component achieved scores ranging from 90,83% to 91,67%, covering alignment with learning outcomes and objectives, content accuracy, and completeness of supporting materials. The presentation validity component also demonstrated high validity, with scores ranging from 82,22% to 93,33%, which included presentation techniques, instructional organization, and completeness. Likewise, the language validity component was rated as very valid, with scores between 90% and 96,67%, reflecting clarity, appropriateness for students' developmental levels, and logical coherence. Additionally, the integration of Islamic values obtained a score of 90%, confirming that spiritual and moral aspects were appropriately and proportionally embedded within the LKPD.

These high validation results indicate that the quality of the LKPD was not only due to its content alignment with the curriculum but also to its systematic structure, communicative language, and contextual integration of Islamic values throughout the learning process. This integration enabled students to understand mathematical concepts not merely procedurally but also meaningfully by connecting them with Islamic principles. This finding is consistent with Hasibuan and Wandini, who emphasized that learning integrated with Islamic values enhances students' learning motivation and supports their spiritual character formation (Hasibuan & Wandini, 2024). Therefore, the very valid category reflects the successful development of an LKPD that effectively combines academic rigor and spiritual depth, supporting both cognitive and character development among students.

Following the content expert validation, several recommendations were made for improving the LKPD. These included adding components such as a bibliography, preface, learning outcomes, Instructional objectives, author biography, and table of contents, in order to create a more complete and well-structured LKPD. Moreover, it was suggested to include instructions for students to recite opening and closing prayers collectively in the usage guidelines. This was considered important to promote engagement and encourage students' direct interaction with the Islamic-integrated LKPD. Figure 4 shows the LKPD after revisions were made based on these expert suggestions.

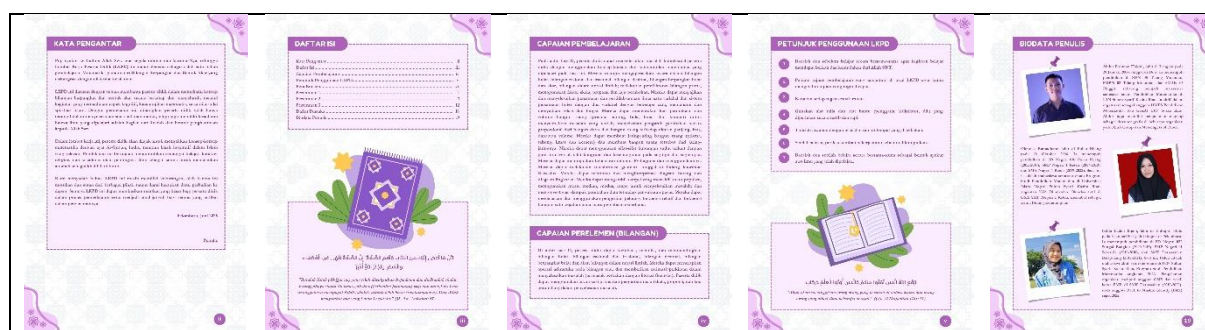


Figure 4. LKPD display after revisions based on feedback from content expert validators

The validation results from the instructional design experts yielded a total score of 502 out of 525, resulting in an overall validity level of 95,62%, which falls within the very valid category. This outcome indicates that the Islamic-integrated mathematics worksheet (LKPD) on exponents fulfills the validity criteria in terms of design quality, visual presentation, and the incorporation of Islamic values.

The graphical validity aspect, encompassing the LKPD's size, cover, and internal layout, obtained scores exceeding 93%, reflecting that the visual elements were developed with careful attention to proportion, aesthetics, and readability. A well-designed and visually engaging layout is known to significantly enhance students' motivation to learn (Reza et al., 2024). In this regard, the visual components of the LKPD contribute psychologically by fostering an enjoyable and immersive learning atmosphere, thereby encouraging students to engage more actively with the content.

This result aligns with the findings of Fadhil et al., who emphasized that a balanced composition of color, form, and layout stimulates students' emotional involvement and promotes concentration during learning activities (Fadhil et al., 2024). In essence, an effective visual design not only enhances aesthetic appeal but also fosters positive perceptions toward the learning process. Similarly, Setyaedhi et al., noted that aesthetically pleasing and communicative graphic design can reduce cognitive load, facilitating more efficient comprehension through visual representation (Setyaedhi et al., 2023).

Thus, the high graphical validity achieved in this study can be attributed to the effective application of aesthetic and visual communication principles, which make the LKPD not merely attractive but also pedagogically meaningful. The integration of these design principles allows students to relate mathematical ideas to engaging visual experiences, ultimately strengthening both motivation and learning effectiveness.

Furthermore, the validation results for the integration of Islamic values reached 91,67%, signifying that spiritual and moral dimensions were systematically and contextually embedded

throughout the instructional materials. This finding is consistent with Karuniawati and Wulantina, who found that a contextual-based LKPD integrating Islamic values achieved high validity levels for both media (88%) and Islamic values (92%) (Karuniawati & Wulantina, 2025). Such results underline the crucial role of contextual approaches in ensuring that Islamic principles are meaningfully incorporated into learning rather than added superficially. Likewise, Fazira and Jayanti reported that a guided inquiry-based LKPD integrated with Islamic values achieved strong media validity (96,15%) and Islamic value validity (82,86%) (Fazira & Jayanti, 2023). The convergence of these studies suggests that both contextual and inquiry approaches are effective in embedding spiritual dimensions without compromising mathematical rigor. Consequently, the strong validation results of this study reaffirm that contextually and reflectively integrated Islamic values can enhance both academic quality and character development within mathematics education.

Following the validation of instructional design, several constructive suggestions were provided to further improve the LKPD. One key recommendation was to strengthen the Islamic nuances in the illustrations, as they were considered insufficiently represented. Enhancing the Islamic atmosphere through the addition of more visual elements explicitly reflecting Islamic identity was therefore advised. Moreover, regarding the author's name placement, experts suggested positioning it at the bottom or lower right corner of the cover page with the note "compiled by" to avoid potential confusion among users. Figure 5 presents the revised version of the LKPD, reflecting these expert recommendations and design improvements.

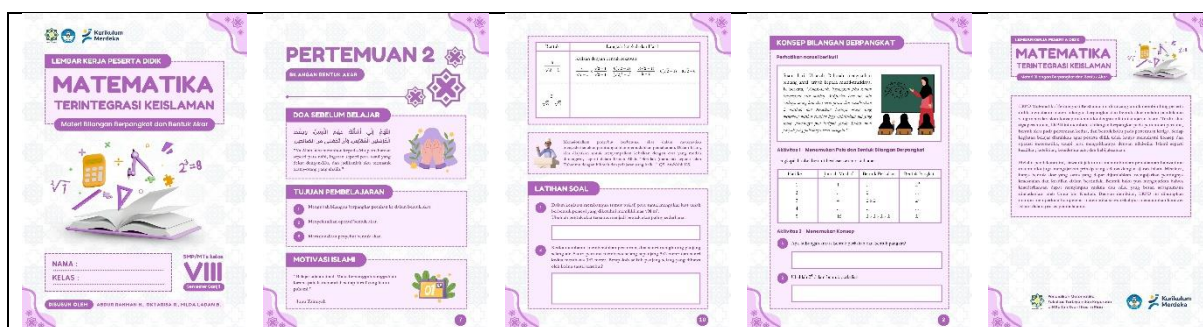


Figure 5. LKPD display after revisions based on feedback from instructional technology expert validators

CONCLUSION

The developed worksheet demonstrates an effective integration of Islamic values into mathematical content in a structured and pedagogically meaningful manner. Its design not only facilitates students' conceptual understanding of exponents and radicals but also cultivates moral and spiritual awareness consistent with Islamic teachings. The integration of Islamic

principles within mathematics learning materials illustrates that religious and scientific knowledge can be harmoniously interwoven to enrich the learning experience, foster character development, and enhance students' motivation to learn. Accordingly, the Islamic-integrated worksheet developed in this study may serve as a valuable instructional resource for Islamic-based schools and a reference model for future innovations seeking to align mathematics education with spiritual and ethical values.

In conclusion, this research has successfully produced a valid Islamic-integrated mathematics worksheet (LKPD) on exponents and radicals, as confirmed through expert validation in content, design, language, and integration of Islamic values. Although the product has demonstrated strong validity, it has not yet been tested in classroom settings. Therefore, future studies are encouraged to conduct practicality and effectiveness testing to evaluate how the LKPD performs in real learning environments and its potential impact on students' engagement and understanding. This next stage is essential to ensure that the validated LKPD can be implemented optimally to support mathematics learning in Islamic educational contexts.

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