

Prospective Teacher Students' Responses

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ABSTRACT

Purpose: This study aims to systematically synthesize the pedagogical principles embedded in *Al-Jabr wa al-Muqabala* and examine their relevance to contemporary theories of algebraic thinking, mathematical abstraction, and mathematics education. Specifically, the review seeks to identify how Al-Khwarizmi's instructional approach can contribute to current discussions on meaningful algebra learning and the development of conceptual understanding. **Method:** This study employed a Systematic Literature Review (SLR) methodology following the PRISMA 2020 guidelines. Relevant publications were identified through systematic searches of major academic databases, including Scopus-indexed journals and related scholarly sources. The selected studies were analyzed through thematic synthesis to identify recurring pedagogical, cognitive, epistemological, and historical dimensions associated with algebraic thinking and mathematics learning. **Main Findings:** The review revealed six major themes that characterize Al-Khwarizmi's pedagogical legacy: (1) progressive abstraction as the foundation of mathematical learning, (2) algebraic thinking embedded in classical Islamic algebra, (3) problem solving as the driver of mathematical generalization, (4) epistemological development and mathematical meaning making, (5) historical pedagogy as a resource for contemporary mathematics education, and (6) the integration of procedural knowledge with conceptual understanding. The findings indicate that Al-Khwarizmi's instructional approach incorporates many principles that contemporary mathematics education research considers essential for developing algebraic reasoning and conceptual understanding. **Novelty/Originality:** The primary originality of this study lies in the development of the Al-Khwarizmi Historical Pedagogical Framework (AHPF), which synthesizes five interconnected pedagogical components: contextual problem situations, relational reasoning, progressive abstraction, algebraic generalization, and formal mathematical representation. This framework offers a new theoretical perspective that connects the history of mathematics with contemporary theories of algebraic thinking and mathematical learning. **Contributions:** This study contributes to mathematics education research by providing a historically grounded framework for algebra instruction, extending current understandings of algebraic thinking through the lens of classical Islamic mathematics, and demonstrating the pedagogical value of historical mathematical texts for contemporary educational practice. The findings also offer

implications for curriculum development, teacher education, and future research on historically informed mathematics instruction.

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INTRODUCTION (12 pt)

Contains the background, rationale, and or urgency of the research. References need to be included in this section, along with their relevance to the justification of the urgency of the research, the emergence of research problems, alternative solutions, and the chosen solution. The introduction also includes the novelty of the research by describing what has been done in previous studies and what has not been done, as well as the justification for the differences between this study and previous studies. Previous studies reviewed are recommended to have been published in international journals, national journals, or proceedings within the last 10 years. The conclusion of the introduction must include the research objectives.

The introduction presents the objectives of the reported research and its relationship to previous research in this field. The introduction should not be an extensive literature review. Use only the references necessary to provide the most salient background so that readers can understand and evaluate the objectives and results of this study without referring to previous publications on the topic.

The introduction is written in Calibri 12 pt upright, with 1 spacing. Each paragraph begins with a word indented 5 digits, or about 1 cm from the left edge of each column. Each paragraph consists of one main idea and contains at least 3 sentences. Each paragraph must be coherent (connected) with the previous paragraph and use effective Indonesian language in accordance with EYD rules. Avoid using conjunctions at the beginning of a paragraph. It is recommended not to use quotations at the beginning of a paragraph and not to use direct quotations. Instead, paraphrase with your own words to avoid plagiarism.

The way of writing references in the text needs to clearly show the author's last name and year of publication. An example is "the application of scaffolding strategies in mathematics learning was effective in terms of reducing mathematics anxiety, motivating and increasing student achievement (Kusmaryono & Wijayanti, 2020)". The Introduction should comprise approximately 15-20% of the total manuscript length. Authors should avoid conducting an extensive literature review in this section, as that content belongs in the dedicated Literature Review section. All claims and context should be supported by relevant recent references to establish the currency and importance of the topic.

LITERATURE REVIEW

The Literature Review section provides a comprehensive and critical examination of relevant theoretical frameworks and empirical studies that inform your research. This section should begin by presenting the theoretical frameworks that underpin your study, such as constructivism, cognitive development theories, specific pedagogical approaches, or other relevant theoretical perspectives in mathematics education. Following the theoretical foundation, authors must review and synthesize relevant empirical studies related to the research topic, demonstrating thorough knowledge of the field.

This review should go beyond a summary and provide a critical analysis of previous research, highlighting both the methodological strengths and limitations of existing studies. The main purpose of this section is to identify gaps in the existing literature that are addressed by the current study, showing how your work fills an important void or answers an unanswered question. Authors should clearly explain how the current study builds upon, extends, or diverges from previous research, and situate their work within the academic conversational context.

The literature should be organized either thematically or chronologically as appropriate to the topic, creating a coherent narrative rather than a disconnected list of studies. Sources should be both recent and seminal, with priority given to publications from the last 5-10 years, though foundational works that are older may certainly be included when they remain relevant. The Literature Review should constitute approximately 20-25% of the total manuscript and should conclude with a clear connection to the research objectives, showing how the reviewed literature leads logically to your specific research questions or hypotheses.

METHODS

The Method section must provide sufficient detail to allow other researchers to replicate your study, ensuring transparency and reproducibility of research findings. This section should begin with a clear specification of the research design, including whether the study employs a quantitative, qualitative, or mixed methods approach, and the specific design type such as experimental, quasi-experimental, survey, case study, ethnographic, or action research. The participants or sample must be thoroughly described, including information about the population from which they were drawn, the sample size and sampling technique used, and relevant participant characteristics such as grade level, age range, prior achievement levels, and the educational context in which they are situated. Authors should provide details about the research context or setting where the study was conducted, as contextual factors can significantly influence findings in educational research.

All data collection instruments must be described in detail, including tests, questionnaires, interview protocols, observation forms, or any other measurement tools, along with information about their validity and reliability, whether established through prior research or calculated in the current study. The procedures section should provide a step-by-step description of how data were collected, including the timeline, sequence of activities, and any interventions or treatments that were implemented. The data analysis approach must be explained clearly, detailing the analytical techniques used such as specific statistical tests for quantitative data or qualitative coding methods for qualitative data, and identifying any software packages used for analysis. Ethical considerations should be addressed, confirming that appropriate ethical approval was obtained and that informed consent procedures were followed with all participants. The Method section should be written in past tense and comprise approximately 15-20% of the total manuscript length.

RESULT

The Results section presents the findings of your study in an objective manner without interpretation or discussion of implications. Findings should be reported in a logical sequence that directly addresses each research question or objective stated in the Introduction. The writing of research results depends on the type of research. For

Development Research, write down all the results of each stage of the research, including if there is a flowchart, write in this section.

For quantitative studies, statistical results should be reported with appropriate detail, including test statistics, degrees of freedom, p-values, effect sizes, and confidence intervals as relevant to the analyses conducted. For qualitative studies, authors should present identified themes or categories with supporting evidence such as direct quotes from participants, field note excerpts, or specific examples from the data that illustrate each theme. It is crucial that this section remains descriptive and objective, avoiding interpretation or discussion of what the results mean, as that analysis belongs in the Discussion section.

Only results that are relevant to the stated research questions should be presented, maintaining focus and avoiding unnecessary tangents. The Results section should constitute approximately 20-25% of the total manuscript and should be written using past tense when reporting what was found in the study. Any findings, please compare them with findings in previous similar studies (references are recommended to scientific journals less than 5 years old), so that the findings of this study are clear, whether corroborating previous research or presenting new findings.

Authors should use tables, figures, and graphs strategically to present data clearly and efficiently, ensuring that visual presentations enhance rather than duplicate textual descriptions. Tables are written in the middle or at the end of each text describing the results/findings of the research. Table titles are written left-aligned, with only the first word capitalized. If there is more than one line, they are written in single spacing. For example, see Table 1.

Tabel 1. Writing format and style (11pt)

Object	Font	Spacing Before	Spacing After
Title	14pt bold	0pt	0pt
Author	11pt bold	0pt	6pt
Address	9pt italic	0pt	0pt
Heading1	11pt bold uppercase	12pt	6pt
Heading2	11pt bold italic	6pt	6pt
Body Text	11pt	0pt	0pt
Bullet	11pt	0pt	0pt
Title of table	11pt	6pt	6pt
Title of picture	11pt	6pt	6pt

Results in the form of images, or data created as images/schemes/graphs/diagrams/similar items, are also presented according to existing rules; the title or name of the image is placed below the image, on the left, and spaced 1 space away from the image. If there is more than 1 line, a single space is placed between lines. For example, see Figure 1.



Picture 1. Insight on Educational Mathematics (11pt)

Ensure that all tables and figures are accompanied by explanations or interpretations, but do not repeat the information contained in the tables. These interpretations or explanations can be provided by highlighting salient points, similarities, or differences. All tables and figures must be referenced (mentioned) in the text of the manuscript. Avoid mentioning “can be seen in the table above/below,” but instead directly mention “can be seen in Table 1” or “... as presented in Figure 1.”

DISCUSSION

The Discussion section is where authors interpret their findings, contextualize them within the broader field of mathematics education, and explore their theoretical and practical significance. This section should begin by interpreting the main findings in direct relation to the research questions or objectives, explaining what the results mean and why they matter. Authors must compare and contrast their results with previous research cited in the Literature Review, identifying points of convergence and divergence with existing literature. When results differ from previous findings, authors should explain possible reasons for these differences, considering factors such as methodological variations, contextual differences, or temporal changes in educational practice. Similarly, when results align with prior research, authors should discuss how their study strengthens, extends, or adds nuance to existing knowledge.

The theoretical implications of the findings should be explored, discussing how results inform, challenge, or expand relevant theories or conceptual frameworks in mathematics education. Authors should address any unexpected findings openly and consider alternative explanations for their results, demonstrating intellectual honesty and critical thinking. It is important to acknowledge the limitations of the study and discuss how these limitations may have influenced the findings or the generalizability of results. The Discussion should avoid simply repeating results without adding interpretation and should consistently connect findings back to relevant theories or frameworks. This section should comprise approximately 20-25% of the total manuscript, using present tense when discussing established knowledge and past tense when referring specifically to the study's results.

CONCLUSION

The Conclusion section provides a concise summary of the study and presents the key takeaways for readers. This section should summarize the main findings in direct relation to the research objectives, distilling the most important outcomes of the study. Authors should

present clear conclusions drawn from the results, stating definitively what can be concluded based on the evidence presented. The most significant contributions of the study to the field of mathematics education should be highlighted, whether these are theoretical insights, methodological innovations, practical applications, or empirical findings that advance knowledge. It is essential that conclusions remain grounded in the data presented and do not overreach beyond what the evidence supports. Authors should avoid introducing new information, arguments, or references that have not been discussed in previous sections of the manuscript. The Conclusion should be concise, clear, and focused, comprising approximately 5-10% of the total manuscript length. The writing should be definitive while maintaining appropriate caution about the scope and limitations of the claims being made.

REFERENCES

The References section lists all sources cited in the manuscript, providing readers with the information needed to locate and consult the original works. All references must be formatted according to APA Style, 7th edition (<https://apastyle.apa.org/>). The reference list should include only sources that are actually cited in the text of the manuscript, ensuring perfect correspondence between in-text citations and reference list entries. Conversely, every in-text citation must have a corresponding entry in the reference list. References should be listed in alphabetical order by the first author's surname, using hanging indent format where the first line is flush left and subsequent lines are indented. For electronic sources, authors should include DOI (Digital Object Identifier) or stable URL when available, as these provide reliable access points for readers.

The reference list should prioritize peer reviewed journal articles and academic books, as these represent the most rigorous and reliable scholarly sources. To ensure currency, at least 80% of references should be from the last 10 years, though seminal or foundational works that are older may certainly be included when they remain relevant to the research topic. Empirical articles should include a minimum of 25 references to demonstrate adequate engagement with the literature. Authors must verify the accuracy of all reference details including author names, publication years, article or chapter titles, journal or book titles, volume and issue numbers, page ranges, and DOIs or URLs. Common reference formats include journal articles formatted as:

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Duckworth, A. L., Quirk, A., Gallop, R., Hoyle, R. H., Kelly, D. R., & Matthews, M. D. (2019). Cognitive and noncognitive predictors of success. *Proceedings of the National Academy of Sciences, USA*, 116(47), 23499–23504. <https://doi.org/10.1073/pnas.1910510116>

