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REVIEWER'S REPORT

Manuscript No.: IJAR-57870

Title: Meaningful Learning Through Scientific Experiments: Its Impact on Learning Skills and Information Processing Among Elementary School Students in Science Education

Recommendation:

Accept as it is .....
Accept after minor revision.....
Accept after major revision .....
Do not accept (*Reasons below*) .....

Rating	Excel.	Good	Fair	Poor
Originality	…			
Techn. Quality	…			
Clarity		…		
Significance	…			

Reviewer's ID: JPR- 180

Detailed Reviewer's Report

This paper, "***Meaningful Learning Through Scientific Experiments: Its Impact on Learning Skills and Information Processing Among Elementary School Students in Science Education***," investigates the effectiveness of inquiry-based scientific experimentation in enhancing learning outcomes among fifth-grade students. The study addresses a significant issue in contemporary education: moving beyond rote memorization toward meaningful learning experiences that foster critical thinking, problem-solving, and information-processing skills. Using a quasi-experimental design, the researcher compared an experimental group taught through inquiry-based scientific experiments with a control group receiving traditional instruction.

The theoretical foundation of the study is well established, drawing on Ausubel's Meaningful Learning Theory and constructivist perspectives. The literature review effectively explains how inquiry-based learning encourages students to actively construct knowledge through observation, experimentation, and evidence-based reasoning. The author also highlights the importance of information-processing skills in science education and supports the study's rationale through relevant previous research demonstrating the benefits of inquiry-oriented teaching approaches. Methodologically, the study employs a clear research design involving 61 fifth-grade students divided into experimental and control groups. Data were collected using achievement tests structured according to Bloom's Taxonomy and designed to assess multiple cognitive levels, including remembering, understanding, application, analysis, and inference. The use of pre-test and post-test measures strengthens the study's ability to evaluate the effectiveness of the intervention. The validity of the instrument was enhanced through expert review, although more detailed statistical evidence regarding reliability would have further strengthened the methodology. The findings demonstrate a substantial improvement in the performance of students exposed to inquiry-based scientific experiments. While both groups showed similar pre-test scores, the experimental group achieved significantly higher post-test results, indicating the positive impact of meaningful learning strategies. Qualitative observations further revealed improvements in analytical thinking, scientific interpretation, information organization, problem-solving abilities, and classroom engagement. These findings support the argument that hands-on scientific experimentation promotes deeper understanding and more effective cognitive processing than traditional teaching methods. A major strength of the paper lies in its practical relevance. The discussion successfully connects the findings to established educational theories and demonstrates how inquiry-based learning can enhance both academic achievement and higher-order thinking skills. The educational implications are particularly valuable, offering recommendations for teachers, curriculum developers, policymakers, and teacher-training programs to incorporate more active and experiential learning opportunities into science education.

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Despite its contributions, the study has several limitations. The sample size is relatively small and restricted to a single school, which limits the generalizability of the findings. Additionally, the intervention period was short, and the study focused exclusively on fifth-grade science education. Future research involving larger and more diverse samples, longer intervention periods, and different subject areas would provide a broader understanding of the long-term effectiveness of inquiry-based learning approaches.

Overall, this is a well-structured and educationally significant study that provides convincing evidence for the benefits of inquiry-based scientific experimentation in elementary science classrooms. The research contributes to the growing body of literature supporting student-centered learning approaches and offers practical insights for improving science education through meaningful and active learning experiences.