## REVIEWER'S REPORT

**Manuscript No.: IJAR-55329**

**Title:** DEVELOPMENT A CODE VISUALIZATION TOOL ON LOOPING MATERIAL SPECIFICALLY " FOR" AND " WHILE" TO IMPROVE STUDENTS' LEARNING OUTCOMES.

**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 Name: Shafiya Akhter**

## Reviewer's Comment for Publication.

The manuscript presents the development and evaluation of a web-based Code Visualization Tool designed to support students' understanding of looping concepts, specifically **for** and **while** loops. The topic is relevant and timely, as difficulties in grasping control flow and iteration are well-documented challenges for novice programmers. The study contributes to programming education research by offering a focused visualization tool rather than a general-purpose environment.

A major strength of the paper lies in its **clear instructional design framework**, employing the ADDIE model systematically from needs analysis to evaluation. The methodological approach is appropriate for a Research and Development (R&D) study, and the use of expert validation, student response analysis, and pre-test/post-test effectiveness testing strengthens the credibility of the findings. The reported improvement in learning outcomes (N-Gain = 0.48, medium category) demonstrates that the developed tool has a positive and measurable impact on students' conceptual understanding of looping.

The results and discussion section is supported by empirical data, including validation tables, student perception scores, and learning outcome statistics. The visualization features—step-by-step execution, variable tracking, and interactive controls—are pedagogically sound and well aligned with constructivist learning principles. The discussion appropriately connects findings with previous studies on program visualization and learning effectiveness.

**REVIEWER'S REPORT**

However, **minor revisions are necessary** before publication. The manuscript would benefit from careful **language editing** to improve grammatical accuracy, sentence structure, and consistency in terminology (e.g., repetition of headings, spacing, and formatting issues). Some sections, particularly the Results and Discussion, could be more concise to avoid redundancy. Additionally, the discussion on gender-based score differences should be interpreted cautiously, as the sample size is limited and may not support strong comparative conclusions.

The conclusion effectively summarizes the study's contributions but could be strengthened by adding clearer implications for broader programming curricula and suggestions for future development, such as scalability, integration with other programming topics, or long-term learning retention.

Overall, the manuscript demonstrates **good originality, sound technical quality, and practical significance** in the field of programming education. With minor revisions focused on clarity, language refinement, and presentation, the paper is suitable for publication.