

Enhancing Scientific Reasoning; The Effectiveness of Generative AI Learning Assistant: An Explanatory Sequential Method

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Abstract

Education in the 21st century requires learners to develop transferable skills such as critical thinking, collaboration, creativity, digital literacy, and lifelong learning. In science education, these skills are closely linked to scientific reasoning, which is increasingly important as artificial intelligence (AI) reshapes how students access, process, and apply information. This study examined the influence of generative AI (Gen AI) learning assistants on the scientific reasoning skills of senior high school biology students at Philippine Christian University. Using an explanatory-sequential research design, the study involved a quasi-experimental approach to obtain quantitative data followed by group interviews for qualitative data. The experimental group used an AI-integrated biology module aligned with Lawson's Classroom Test of Scientific Reasoning (LCTSR), while the control group received conventional instruction. Students' scientific reasoning levels were assessed before and after the intervention to determine changes in reasoning performance and thinking patterns. Results showed a marked improvement in the experimental group, with students shifting from transitional to formal operational thinking. The proportion of students classified as having formal operational thinking increased from about 16% before the intervention to 89% after the intervention, whereas the control group reached only 30%. Statistical analysis revealed a significant difference between the groups, with a p-value of 0.001, indicating that the AI intervention had a positive effect on students' scientific reasoning skills. The findings suggest that Gen AI, when used as a purposeful reasoning support within inquiry-based tasks and guided instruction, can strengthen students' formal operational thinking in biology. The study provides local evidence that AI-augmented instruction can improve scientific reasoning in science classrooms. A factorial designs or studies to investigate which features of the AI intervention produced the improvement is recommended.

Key words: Biology; Scientific Reasoning; Generative AI-Learning Assistant; Explanatory sequential; Philippine - Asia

