

ENHANCING 7TH-GRADE STUDENTS' UNDERSTANDING OF GEOLOGICAL TIME THROUGH INQUIRY-BASED LEARNING: AN ACTION RESEARCH APPROACH

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ABSTRACT

Geological time is one of the most conceptually demanding topics in science education due to its abstract nature and vast temporal scales, often leading to misconceptions and disengagement among younger students. Traditional teaching methods, typically expository and teacher-centred, have shown limited effectiveness in promoting meaningful learning in this domain. In response, this action research explored the potential of Inquiry-Based Learning (IBL), supported using concept maps and formative feedback tools, to foster a deeper understanding of Earth's history among 7th-grade students (n=47). Grounded in socio-constructivist learning theories and Ausubel's theory of meaningful learning, the intervention was designed to activate students' prior knowledge and encourage conceptual reorganisation through active exploration and collaborative reasoning. Throughout five lessons implemented in two public school classes, students engaged in practical tasks, including fossil analysis, stratigraphic sequencing, and the digital construction of a geologic timeline. Data were collected through participant observation, snapshot reports, and concept maps. The results show a clear improvement in students' ability to identify and relate key geological concepts, such as index and facies fossils, stratigraphic principles, and geologic eras. Concept maps revealed increasingly complex and accurate conceptual structures, while snapshot reports indicated heightened motivation and engagement throughout the intervention. The IBL approach also promoted scientific reasoning, critical thinking, and greater learner autonomy. These findings support the use of integrated active methodologies as a practical and transferable model for science education at the lower secondary level, particularly in addressing abstract geoscientific topics.

Keywords: Action research, Inquiry-based learning, Geological time, Science education.

1. INTRODUCTION

Contemporary education must adapt teaching and learning processes to a generation that requires more dynamic and interactive approaches [1]. In a rapidly evolving scientific and technological landscape, information circulates quickly – often unreliably – making it essential for schools to develop citizens capable of critical thinking, collaboration, digital literacy, effective communication, and autonomous learning [2,3]. These skills are vital for addressing complex problems and responding to continuous societal change.