12 - 14 June 2026 Tokyo , Japan

Enhancing Scientific Explanation through Socio-Scientific Issues and Model-Based Learning (SIMBL): A Classroom Action Research on Physics Education

Nattapon Intarata , Nattapon Intarata

Mahasarakham University, Thailand

Abstract

This study investigated the role of Socio-Scientific Issues and Model-Based Learning (SIMBL) to enhance scientific explanations, in particular students' scientific explanation abilities in momentum and collision in tenth grade students in the context of the topic of science in these subjects. The objectives were to enhance students' capacity to construct scientific explanations, develop their knowledge of claim, evidence and reasoning and examine the impact of SIMBL on their overall scientific skills. Classroom action research in study with 31 students who participated in a six-lesson SIMBL intervention. The students' scientific explanation descriptions were assessed, classroom observations, and interviews were conducted with students, and learning artifacts were examined based on descriptive statistics. Qualitative data were collected with descriptive statistics and qualitative data were analyzed through content analysis based on claims and evidence analytics based on Claim-Evidence-Reasoning (CER) methodology. We found great improvements in students' scientific explanation skills (especially in the ability to construct claims and evidence), although reasoning is still the most challenging part of the process. An inquiry-based approach to evidence-building, together with modeling and discussion guided reasoning development. SIMBL appears to be an effective teaching method for students' science explanation and scientific literacy skills. This study also underscores the need for more scaffolding to enhance students' reasoning skills and suggests how context-based science instruction needs to be integrated in socio-scientific context and modeling so as to promote meaningful learning.

Keywords: Classroom action research; Physics education; Model-based learning; Scientific explanation; Socio-scientific issues