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Problematization in Science and Engineering: Student-created Problems and Inquiry

Fátima Bento , Fátima Morais , Júlia Tovar , Raquel Oliveira , Sandra Franco , Teresa Malheiro , Teresa Monteiro

University Of Minho, Portugal

Abstract

This study presents a pedagogical intervention that activates Creative Cognitive Processes (CCP) as a learning method in higher education STEM courses. The intervention took place across four courses with about 130 students as part of an IDEA-UMinho project. Students were encouraged to ask questions and formulate problems to analyze programmatic content, protocols, and learning exercises within theoretical, practical, and lab sessions. To track implementation, a short questionnaire was given after each class to assess engagement, and a post-intervention survey gathered students' perceptions. While the main goal is to promote creativity, immediate effects mainly appeared in transversal skills that supported students' motivation to mobilize problem-creation and questioning. In the short term, this approach improved the structuring of thoughts, organization of ideas in cause-and-effect relationships, and analytical reasoning through questioning, thus enhancing students' critical thinking. This work is ongoing, and during the conference, an example from a lab class will be presented to demonstrate how problematization and inquiry can be effectively used in the gradual development of creative thinking.

Keywords: Active Learning, Creativity, Higher Education, Questioning, Student Engagement