

Problem-Solving before Instruction (PS-I) in Engineering Education: Mechanisms, How tos, and Outcomes (Poster)

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Abstract

Problem-solving before Instruction (PS-I) has emerged as a critical pedagogical approach in education, offering a robust framework for enhancing deep learning and problem-solving skills. In traditional engineering courses, students are often guided through Direct Instruction (DI) before solving problems, which can limit opportunities for exploring the underlying complexity of concepts. In contrast, PS-I reverses this sequence, requiring students to first engage with challenging, ill-structured problems before receiving formal instruction. This encourages active exploration, creative thinking, and resilience, as students must draw upon prior knowledge, make connections, and confront gaps in their understanding. This study presents a teaching intervention aimed at improving learning comprehension in an electrical circuits course (n=165) at an Electrical and Computer Engineering faculty by utilizing PS-I during an applied module on transients in second order electrical circuits. During the intervention students solved open-ended circuit analysis problems involving differential equations in groups before receiving formal guidance on solution methods. Following the problem-solving activity, students received targeted instruction via a recorded lecture and in-class tutorial lesson aimed at linked theory to the

challenges students had encountered. Preliminary results reveal that PS-I led to active in-class engagement, a positive learning experience, and slightly improved final exam scores.

Keywords: Problem-Solving before Instruction (PS-I), Engineering education, Learning Design.

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