Developing a Troubleshooting Learning Environment for Complex Engineering Problems

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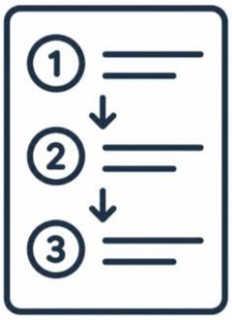
EDU Core Research

#2422510: Developing a Troubleshooting Learning Environment

Why is troubleshooting difficult to teach?



Engineering laboratories are **recipe-based**. When unpredicted failures occur students are not prepared.

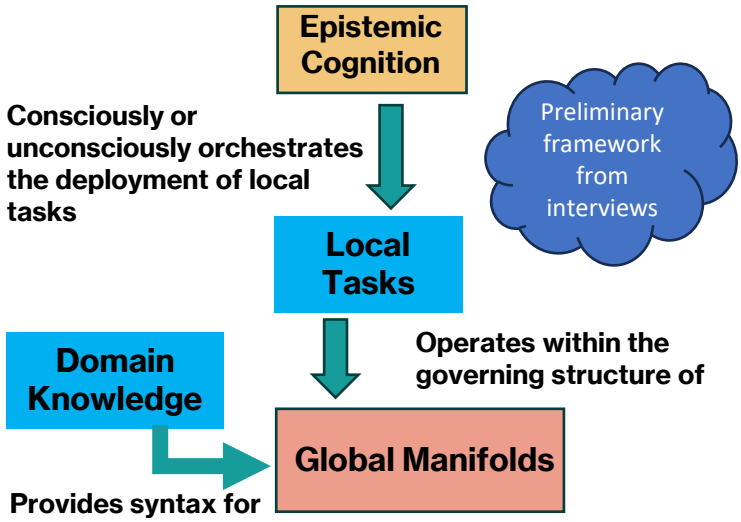
Students experience complex and ill-structured problems when they graduate. Do we over-simplify in education?

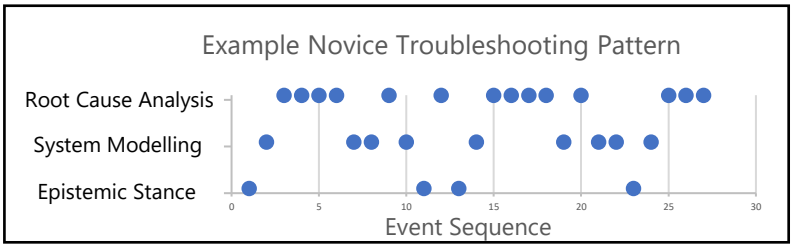
Regular	Complex
Routine Problems	Ill-structured Problems

RQ1: What constitutes troubleshooting expertise in industry?

RQ2: How can a troubleshooting learning environment support adaptive troubleshooting skills?

Expert structure





What is Not Yet Known

In what ways functional block diagrams and argument maps support system knowledge and causal thinking?

Methods

Interviews | Think-aloud

- Semi-structured interviews (n=22) and think aloud problem solving (n=6) with expert engineers.
- Experts in defense, biomedical, manufacturing, and academia.
- Thematic analysis guided by Spiro's CFT and Jonassen's troubleshooting framework.

Challenge Area

Complexity

How can complexity be taught without overwhelming novices?

How to change students' stance towards solving complex problems?

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Machines & Minds Lab