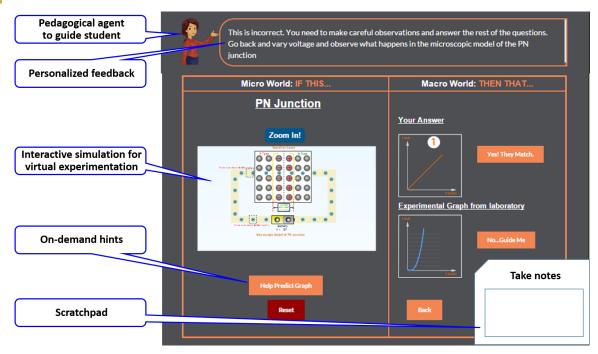# Technology Enhanced Learning of Thinking Skills (TELoTS)

Working in an institution of higher education, we worry about whether students are really 'getting it'. Is our teaching effective in exciting students into learning about core concepts? Are they able to develop, apply and transfer the required concepts and skills to solve problems? In our research, we design and develop technology enhanced learning systems to promote students' pan-domain thinking skills. We focus on engineering and science domains, using disciplinary content as a vehicle to develop the relevant thinking skills.

Thinking skills are cognitive processes that people apply for sense-making, reasoning and problem solving. Many thinking skills in engineering and science share common characteristics that have applicability across domains. Examples of such pan-domain thinking skills include design thinking, systems thinking, computational thinking, estimation, problem-posing, data representation and analysis, and so on. While the importance of thinking skills has been well-established, teaching and learning thinking skills is a complex problem. Research shows that learners are not able to apply thinking skills after instruction in traditional disciplinary content; hence the development of thinking skills requires explicit instruction, supported by careful pedagogical and technological design.

Our interventions, TELoTS systems, are based on the pedagogical strategies of inquiry-based learning, formative assessment and meta-cognitive reflection. Learning activities in the TELoTS systems harness technology affordances such as interactive simulations, adaptive and personalised feedback, and pedagogical agents to provide the required instructional support. To evaluate our interventions, we have conducted empirical studies with undergraduate engineering and science students from Mumbai University colleges. Results from quasi-experimental studies show that TELoTS systems help students develop and apply the thinking skills effectively. Qualitative interaction analysis studies have led to insights of how students learn productively while interacting with technology enhanced learning systems.

Prof. Sahana Murthy, Interdisciplinary Programme in Educational Technology, sahanamurthy@iitb.ac.in