Transforming STEM Education with Design Thinking: A Student-Centric Approach to Problem-Based Learning

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This poster showcases the Technology-Enhanced Learning (TEL) pedagogy designed for a health discipline course at an Australian University. The use of the design thinking process for problem-based learning was implemented to enhance first-year students' creative and digital skills. Collaboration with the industry partners enabled an authentic learning experience.

In the post-COVID era, students are more diverse, demanding, discerning, and inclined towards flexible learning to shape their educational experiences. To meet these evolving needs, we adhered to digital accessibility guidelines and Universal Design for Learning (UDL) principles, promoting inclusive education. A student-centric approach to TEL pedagogy is essential for delivering authentic and connected learning experiences (Ní Shé, 2022). In our health course, we designed interactive content using HTML5 Package (H5P) to create engaging learning materials and activities in health course modules. This included multiple-choice questions, interactive text, images, and videos, providing opportunities for students to answer questions, solve problems, and explore content knowledge. This also included formative feedback and opportunities for students to test their understanding.

Additionally, design thinking was incorporated to allow students to test their understanding of the health applications, solve 'wicked' real-world problems and create human-centric solutions (Brenner et al., 2016). In a three-week course module, Week 1 presented an open-ended real-world problem, designed and developed in collaboration with an industry partner, to help students understand user needs and pain points. Later in the week, students defined the problem by narrowing the scope down and identifying characteristics of the user persona. In Week 2, students ideated multiple responses to the defined problem, utilising problem-solving skills and creativity (Jia, Jalaludin, & Rasul, 2023) to think critically and brainstorm the appropriate solutions using Miro, and then created a low-fidelity prototype to meet the user requirements. In Week 3, students applied their knowledge to test the solution against user needs, constructively aligned with the industry practices.

Through the experience of design thinking to solve open-ended, real-world problems, we employed problem-solving learning pedagogy to develop an iterative process of group work (Damşa & Wittek, 2020). Academics acted as facilitators rather than traditional lecturers, providing support and resources as needed, but allowing students to take the lead. Students took responsibility for their learning by collaborating to explore design thinking and refining their solutions as they gathered information and feedback from various sources, integrating their own disciplinary knowledge as jigsaw pieces (Calkins & Rivnary 2022). For the purpose of authentic assessment, we designed challenging activities that required students to apply design thinking in problem-solving. The assessment tasks focused on both the process and the final solution, as well as the reflective component, including self-assessment and peer assessment. Students increased their effort towards this problem-based assessment because it held more real-life relevance and allowed them to apply their knowledge and skills in practical contexts.

Keywords: Technology-enhanced Learning (TEL) pedagogies, design thinking, problem-based learning, innovation, universal design for learning (UDL)

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