

Title:

From Drawing to Touch: Exploring Embodied Learning Through 3D Printing Pedagogy in Geosciences Education.

Mr Gideon Brunsdon (Department of Geosciences, Faculty of Science) and Dr Jean-Pierre Basson (Department of Architecture, Faculty of Engineering, the Built Environment and Technology)

Affiliation: Nelson Mandela University

Sub-theme:

Innovative and Technology-Enhanced Learning and Teaching

Format:

Paper Presentation

Abstract:

Students often struggle to translate two-dimensional representations into meaningful spatial understanding, particularly when engaging with complex geographical and environmental concepts. Despite the use of detailed diagrams, orthographic drawings, and step-by-step instructional material, students within a Structural Geology module had trouble visualising and comprehending the technical drawings that they constructed during practical sessions and relating it back to what it represents in a real-life scenario in 3D. . This paper reflects on a transdisciplinary collaboration between Geography and Architecture that sought to address this pedagogical challenge through embodied learning, maker pedagogy, and tangible learning approaches.

Emerging from a Teaching Development and Innovation Fund (TDIF) initiative, the project drew on architectural model-making principles and digital fabrication processes to transform abstract theoretical content into a physical, interactive learning artefact. Using 3D printing technologies, a 3D block model was developed that allowed students to physically manipulate and deconstruct the learning concept through hands-on engagement. Functioning similarly to a large-scale building block system, students progressively removed components until reaching the final conceptual form, enabling learning through tactile exploration, spatial reasoning, and active participation rather than passive observation.

Grounded in theories of embodied cognition, maker pedagogy, and human-centred learning, the study reflects on the lecturer's experience of observing student interaction across two pedagogical conditions: traditional representational instruction versus tangible and interactive engagement. The paper explores how physical manipulation, transdisciplinary collaboration, and embodied learning environments may support deeper conceptual understanding, improve spatial visualisation, and create more meaningful learning experiences within higher education.

The paper argues that tangible pedagogies and makerspace-informed practices offer significant potential for rethinking how abstract disciplinary knowledge is taught, particularly in contexts where students struggle with visual-spatial interpretation and conceptual abstraction.