



Centre for Change and
Complexity in Learning

Developing Teacher Confidence and Self-Efficacy in Design Education— through Generative AI CAD Integration

Collaborative Research Proposal

Dr Chris Chimwayange: Education Futures, Adelaide University,
University Boulevard, Mawson Lakes, South Australia 5095, Email:
chris.chimwayange@unisa.edu.au, Tel: +61434254115, ORCID 0000-
0002-6791-3395

Dr John Kennedy: Education Futures, Adelaide University, University
Boulevard, Mawson Lakes, South Australia 5095, Email:
john.kennedy@unisa.edu.au



University of
South Australia

Developing Teacher Confidence and Self-Efficacy in Design Education through Generative AI CAD Integration

Project Summary / Abstract

This project aims to empower secondary Design and Technology (D&T) teachers by exploring how Generative AI (GenAI) tools embedded in CAD platforms like Autodesk Fusion 360 can enhance teacher confidence and self-efficacy in adopting emerging technologies in design workspaces. Many teachers face barriers in integrating complex digital tools due to limited experience or confidence. Generative AI has the potential to function not just as a design tool, but also as a pedagogical partner that supports idea generation, modelling, and communication. Through targeted professional development workshops, this study will explore how GenAI-enabled CAD tools influence teacher practices, beliefs, and classroom integration of technology. Outcomes will inform future professional learning models and curriculum innovation in design education.

Background / Rationale

Design and Technology education is at a critical juncture, shaped by the rise of digital fabrication, computational design, and artificial intelligence. Teachers are expected to prepare students for a rapidly evolving technological landscape, yet many feel underprepared to engage with GenAI-Enabled CAD Tools. Traditional CAD training models often fall short in supporting sustained teacher confidence, especially when new technologies appear complex or unfamiliar.

GenAI represents a transformative shift in how design work is performed and taught. Platforms like Autodesk Fusion 360 now integrate AI features that can suggest design alternatives, automate processes, and support rapid iteration. This presents an opportunity to reduce cognitive load and improve teacher engagement with advanced design tools. However, little is known about how these tools influence teacher self-efficacy and whether they can meaningfully support pedagogical transformation. This project addresses that gap.

Proposed Objectives:

1. To explore how GenAI-enhanced CAD tools influence teachers' confidence and self-efficacy in using digital design technologies.
2. To design and implement professional learning workshops that support teachers in engaging with GenAI-assisted CAD and 3D printing tools.
3. To examine changes in teacher attitudes, perceived competence, and classroom integration of CAD technologies following the intervention.
4. To identify effective practices, challenges, and enabling conditions for embedding GenAI-supported design tools in secondary education.
5. To generate practical recommendations for scaling GenAI-supported professional development in design and technology education.

Research Environment

The Centre for Change and Complexity in Learning (C3L) investigates how human and artificial cognition impact knowledge processes and society. The mission and vision of the Centre are embodied in a complexity science framework and methodology, recognising that systems of learning need to be evaluated from multiple perspectives and through various methods. The Centre employs educators, learning scientists, data scientists, computer scientists, engineers, and psychologists working on the most relevant and consequential questions facing society. The complex problems that define contemporary education cannot be understood and managed through traditional, often reductionist, research approaches, instead an integrated, holistic, and networked approach is required.

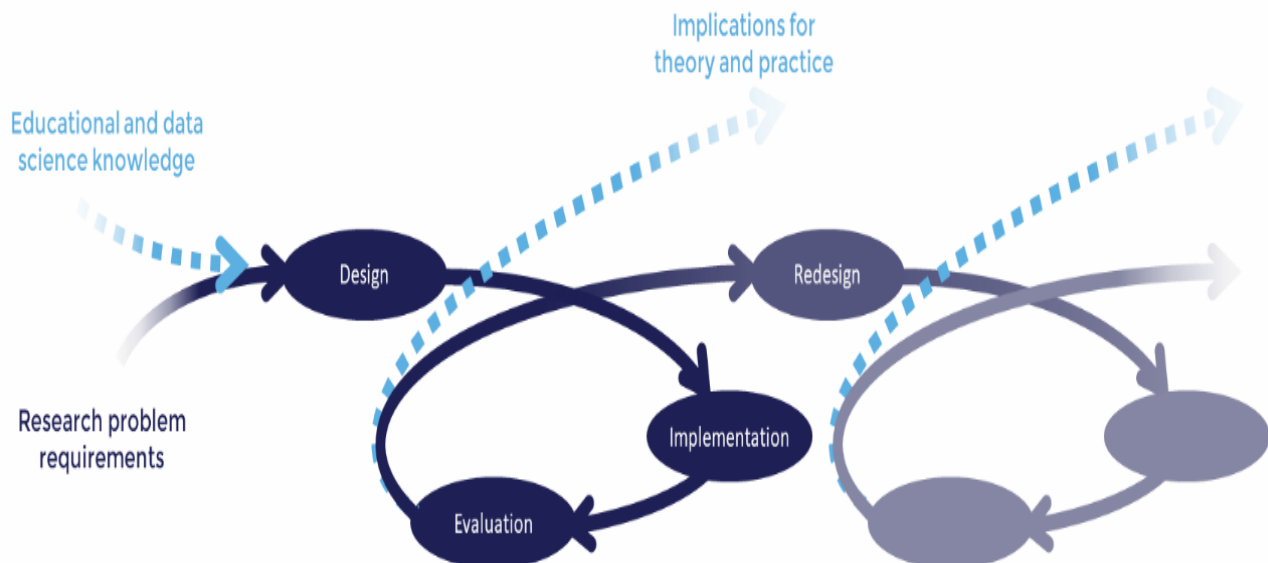
University of South Australia Education Futures is the home of more than 150 academic and professional staff working to deliver quality education and research in the field of education. Our primary research domains include teaching practices, learning sciences, education technology, wellbeing and resilience, culturally responsive pedagogies, digital and online innovation, learning analytics and language and cultural diversity. Our research focuses on scale and impact by establishing lasting partnerships with key stakeholders, such as Government, industry groups, Schools, teachers, learners and community. Education Futures is also home to UniSA College, which provides a range of alternative entry programs, opening the doors for more Pathway into tertiary study.

C3L Research Methodology

The wider proposed project will follow the C3L research methodology. This model has been used extensively to address complex learning and social challenges. This method is grounded in design-based research and adopts a systems-level view of problems. Given that the proposed research project can have a significant impact on Australian school sector, the project follows a set of eight grounding principles that enables research collaboration with schools and teachers to achieve the meaningful translation of research insights into educational practice and policy development.

These principles are:

1. **Theory-informed** – The research is informed by the contemporary pedagogical theories and learning sciences, providing all stakeholders with current and relevant research.
2. **Collaborative** - Research is designed and scoped in collaboration with relevant stakeholders, ensuring different perspectives are appropriately considered.
3. **Meaningful** – Produced results findings are relevant, timely and insightful to policymakers, teachers, students and other stakeholders.
4. **Scalable** – The research insights can be translated from individual schools to the school system level, resulting in relevant guidance for all stakeholders of student success.
5. **Real-time** – The research approach includes feedback loops from practice to conceptual research design stage, resulting in detailed and timely feedback to teachers and school leaders.
6. **Sustainable** – The research process incorporates the school and system capacity development to ensure that the translation of findings into practice is sustainable.
7. **Aligned** – Research process informs organisational priorities and aims in a manner that enables the achievement of school missions and goals.
8. **Iterative** – The research design includes early and timely reporting so that it can evolve and adjust to changing needs and circumstances.



Research Plan

A mixed-methods intervention study will be employed, combining quantitative surveys with qualitative interviews and classroom observations.

Key Tasks and Deliverables

Participants: 12–15 secondary Design and Technology teachers across urban and regional schools will be recruited. Participants will have varying levels of CAD experience.

Phases:

- **Phase 1: Baseline Data Collection**
 - Survey on teacher confidence, self-efficacy, and perceived barriers to technology use.
 - Initial interviews to map current practices.
- **Phase 2: Professional Learning Intervention**
 - Teachers participate in a series of hands-on workshops using Fusion 360 with GenAI functions.
 - Sessions include both technical training and collaborative design challenges.
- **Phase 3: Follow-up Data Collection**
 - Post-intervention survey and interviews to measure shifts in attitudes, knowledge, and confidence.
 - Optional classroom observations or self-recorded teaching reflections.
- **Phase 4: Analysis and Dissemination**
 - Thematic analysis of qualitative data, comparison of pre/post self-efficacy scores, and case study development.
 - Production of a final report, teacher guide, and conference presentation.

5. Expected Outcomes

- Increased teacher confidence and self-efficacy in using GenAI-Enabled CAD Tools.
- Evidence of new pedagogical approaches enabled by GenAI.
- A scalable professional learning model tailored to emerging design technologies.
- Recommendations for curriculum leaders, policymakers, and teacher educators.
- Knowledge contributions to the growing field of GenAI in education and human-AI co-creation.

6. Significance and Innovation

This project is among the first to examine how generative AI can directly support teacher development in design education. It responds to a growing need for professional learning approaches that are responsive to GenAI-enabled workflows and creative tools. By focusing on teacher empowerment rather than just student outcomes, the project foregrounds sustainability, equity, and long-term impact. It offers a vision of technology as an ally in pedagogy, not just a technical skillset to be mastered.

7. Ethics: This research involves the collection of data from human participants and will therefore be subject to the requirements of the UniSA Human Research Ethics Committee. The approvals process will be commenced immediately upon agreement of this project.

8. Intellectual Property: UniSA team retain the right to publish the findings of this research in peer-reviewed scholarly publications. Any general research products generated during the project by UniSA will become the Intellectual Property of UniSA

9. Timeline (12 months)

Month Activity

- 1–2 Participant recruitment, ethics clearance, baseline surveys and interviews
- 3–5 Design and delivery of workshops (in-person or online)
- 6–8 Post-intervention data collection, follow-up interviews
- 9–10 Data analysis, case study development
- 11–12 Report writing, dissemination activities, publication drafting

Australian Export Controls Framework: The research proposed here proposed here relates to technologies that are in the public domain and therefore this research is exempt from the requirements of the Australian Export Controls framework and the Defence Strategic Goods List.

8. Budget Overview

Item	Estimated Cost
Researcher time (0.2 FTE x 6months)	\$12,000
Workshop facilitation/materials	\$10,000
Teacher release / stipends	\$5,000
Software licenses	\$1,000
Travel / accommodation	\$1,000
Data analysis / transcription	\$1,800
Dissemination (report, website)	\$3,500
Total	\$34,300

9. Key Personnel

Project Lead

Dr Chris Chimwayange is a Lecturer in Design and Technology Education at UniSA Education Futures. Chris' research explores how school and classroom practices in Design and Technology (D&T) education can be reimaged to optimise student learning. His work focuses on the intersection of emergent technologies, educational policy, and pedagogical practice, with an emphasis on transforming D&T workspaces into dynamic environments that support constructivist Problem-Based Learning (PBL) and foster Self-Directed Learning (SDL).



Dr John Kennedy is a Senior Lecturer in STEM Education who is building an understanding of the longitudinal changes to students' attitudes towards schooling, particularly in the STEM subjects. He brings 15 years of experience and leadership in schools with him and is leading the development of our Complex Educational Data team.



10. References

- Bandura, A. (1997). *Self-efficacy: The exercise of control*.
- Veliz Reyes, A. (2024). *Generative design and knowledge representation in digital environments*.
- Risko, E. F., & Gilbert, S. J. (2016). *Cognitive offloading*. Trends in Cognitive Sciences.
- Lodge, J. M., et al. (2023). *Learning with AI: Reimagining student–AI relationships*.

