Scientia Education Investment Fund Grants

Final Report

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An analytics-driven Tailored Learning Platform for STEM modules

Faculty of Engineering

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1. Executive Summary

The recent focus on Blended Learning and Digital Uplift has generated a significant increase in the digital teaching assets and potential engagement and assessment data across UNSW courses. With UNSW2025 targeting tailored learning experiences, there was an opportunity to intelligently connect these assets and to architect a world-leading digital platform to proactively deliver customised and optimised learning material to students. We proposed to "close the loop" of *creation of learning material*, to *student engagement in that material*, to *usage and assessment data* back around to the *tailored* creation of learning material. The proposed system was built entirely on UNSW's existing platforms of Moodle, Office365 and SIMS with no integration of third-party components. This ensured scalability across Engineering, STEM and beyond. This system benefitted students by guiding their studies towards achieving competency and micro-credentialing across all learning outcomes thus better preparing them for subsequent learning and practice. Note:

- The original grant submitted was for $196K, and this was reduced twice to just $73K by the PVCE. This large reduction in grant finding has resulting in a similar reduction in scope of the project.
- The impact of the budget reduction has been to reduce the scope of the project from many courses across multiple schools to just two courses in MME.
- The challenges described above have been addressed with a reduce scope of the project.

2. Outcomes and impact

The project was completed by December 2019, though dissemination continues. 100% of the budget was spent. Deliverables are listed below in Table 1.

Table 1. Tasks/deliverables for Tailored Learning project

Task Name	Work
Tailored Learning Part 2	**394 hrs**
Planning	24 hrs
Database and PowerBI	**96 hrs**
Define and design database schema	16 hrs
Integration with Moodle	40 hrs
Tabular Model	8 hrs
Student Scores by week and Topic	16 hrs
Student attendace by week	16 hrs
Power Apps	**80 hrs**
Define database structure	8 hrs
Implementation	72 hrs
Custom Study Guides	**80 hrs**
Page for Course Coordinator to "Trigger"	12 hrs
A button to upload the configuration	12 hrs
Content Packaging	56 hrs
SharePoint Work	**48 hrs**
Landing Page with a list of tasks	20 hrs
Automation of tasks where possible	28 hrs
Project Management	66 hrs

Deliverables, on the reduced project budget, completed:

- Generation of content for two courses: ENGG1300 and ENGG2400 for creation of personalised study packs
- Deployment of AI bot that gathers student engagement data deployed for both courses.

- Generation of online content and AI mappings for bot functions and data gathering systems
- Development and deployment of realtime grade reporting from PowerApp system to feed directly into student dashboards (see Figure 1)
- Initial phase of live personalised SharePoint pages for student experience within Teams. (See Figure 2)

Figure 1. PowerApp live realtime grade reporting system already deployed in two classes. This data feeds into the AzureSQL database that is used to train the Machine Learning model running in the cloud.
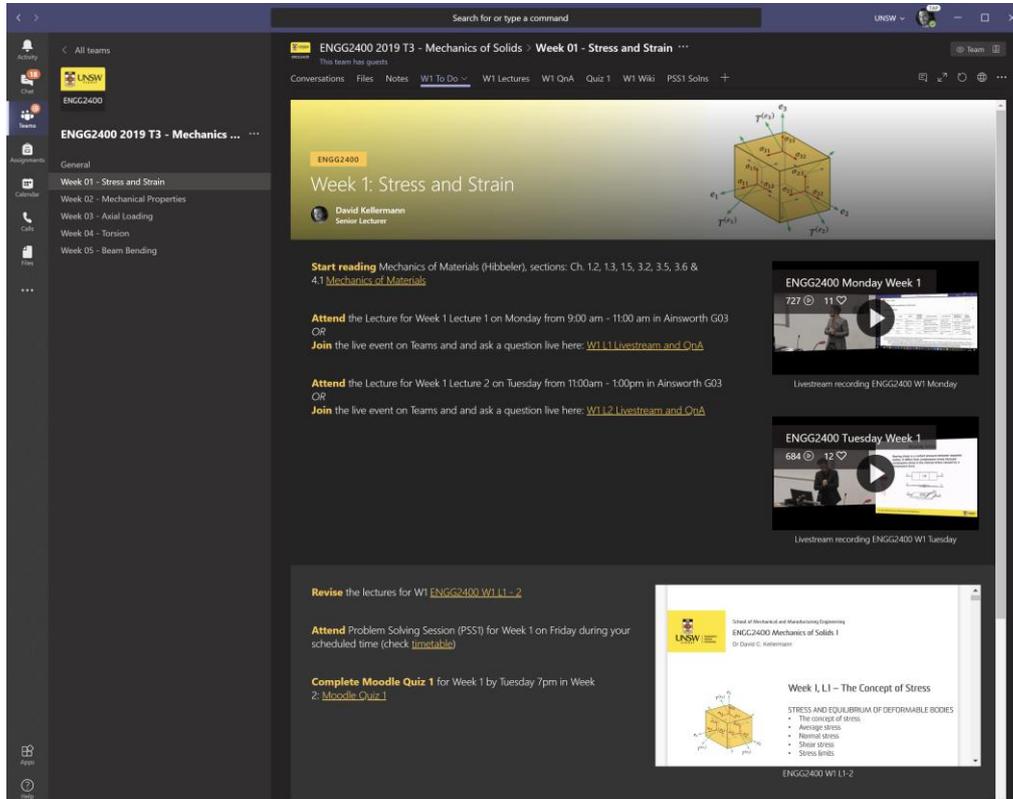

Figure 2. Initial phase of SharePoint page deployment for personalised student layout and data presentation. Phase 2 will have realtime reporting from the PowerApp platform.
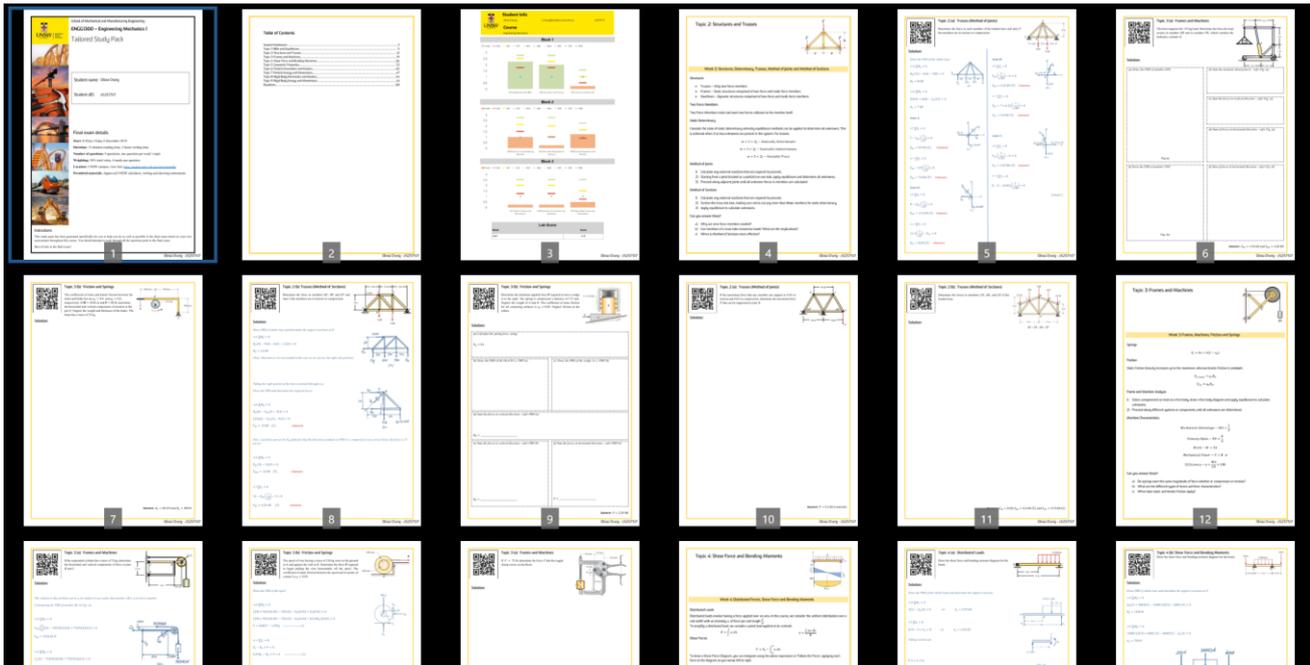
Figure 3. The tailored study packs delivered to over 1,000 students in December 2019

This project addressed two of the key objectives of UNSW2025 theme, *Educational Excellence*. We have developed and demonstrated a platform that *integrates the best available educational technologies to deliver personalised and flexible learning opportunities*. Integration of this platform into UNSW systems has enabled broad application. This has already, through various keynotes and articles, *established UNSW as a global leader in technology-enhanced learning, positioning us as a preferred partner for others at the leading edge of innovation in higher education and digital service delivery*.

Students across the entire School of Mechanical and Manufacturing Engineering have benefitted from this project, when in T2 2020 the entire School delivered every subject using Teams, involving various components of the platform incubated in this project.

3. Dissemination strategies and outputs

The project, with a reduced budget from the initial proposal, was completed early. This is a summary of the key dissemination:

The UNSW Engineering technology has been internationally recognised as pioneering, evidenced in particular by Kellermann's July 2019 keynote to a live stadium audience of 40,000 people, with views climbing over 80,000 on Youtube during COVID-19: T-Mobile Arena, Las Vegas. The innovation and impact of this work earned the 2019 UNSW Vice Chancellor's Award for Teaching Excellence. The AI technology has been disseminated in an open-source code release of Question bot on GitHub, which is now being adopted by a range of universities globally. The educational technology has been disseminated in a range of media going beyond the education sector including: An invited keynote to 1,000 Australian IT and Business leaders in the 2019 Innovate Conference, a keynote alongside THE Chief Knowledge Officer Phil Baty at the 2020 Campus Connections Summit, in numerous articles including: AARNET, Technology Record , IT News, IDM, Tech AU, and four recent podcasts: Building Learning Communities with Technology; Artificial Intelligence in Education; Using Enterprise Software in Education; and Educational Technology during COVID-19.

This work was further the subject of a keynote for [REMOTE: the connected faculty summit](), hosted by ASU on teaching response during COVID-19.

4. Evaluation of project outcomes

Two of the key project outcomes, beyond simply delivering the technological platform proposed include funding opportunities that arose out of the work developed here. These include:

- o It has attracted an additional $50,000 grant from development partners.
- o The bot component of the framework has recently received a HERDC reportable grant of $121,000.
- o A grant of $580,000 for David Kellermann's work on educational technology granted from Microsoft Corporation.

Therefore, the internal funding of $73,000 from PVCE has let the external funding of $751,000 to UNSW, approximately a 10X return on investment.