01 July 2019

*Demonstrating the potential of immersive technology and Serious Play in the Flipped classroom: An Integrated Approach to Experiential Learning*

Information Systems and Technology Management, UNSW Business School

**Project Leaders:**
Dr Michael Cahalane, m.cahalane@unsw.edu.au
Dr Felix Tan, f.tan@unsw.edu.au

**Team Members:**
Dr Sam Kirshner
Professor Richard Vidgen

**Report Authors**
Dr Felix Tan
Dr Michael Cahalane
Dr Sam Kirshner
1. Executive Summary

First, we would like to thank the committee for the SEIF funding that was instrumental in helping the academic leads achieve the ambitious project outcomes. The project developed an integrated approach to enhance/support students’ experiential learning across a number of business courses and programs (INFS2621, INFS2631 and Honours program). The approach is built on the rationale and potential of incorporating immersive technology (Internet of Things and Virtual Reality) and serious play (Design Thinking and Lego Serious Play) into the flipped classroom. Building on principles of design and gamification, the project has introduced novel teaching practices that promote innovative experiential learning and knowledge creation activities. The significant milestones were the introduction of Design Thinking and Lego serious play techniques with the latest developments in both virtual and mixed reality technologies, to provide a conducive and safe environment for students to prototype solutions to complex real-world problems. In terms of impact and recommendations, the project has expose students to emerging industry practices (design thinking in particular) to bring rich engagement in and out of classrooms. The project has also seen the development of a first Virtual Reality Supply Chain Management Game that teaches students the importance of Business Ethics in practice. We encourage other academics to facilitate the creation of highly visual and tactile solution-spaces that can be experienced in both the physical classroom and as virtual artefacts.

2. Outcomes and impact

The projects outcomes are aligned with SEIF Priority 4: Demonstrate the effectiveness of innovative technologies in achieving educational outcomes as well as UNSW’s 2025 strategy, which emphasizes the integration of the best available educational technologies to deliver flexible learning opportunities.

The funding provided by the project allowed the academic team to deliver major achievements in the proliferation of connected devices, mobile and immersive technologies, big data challenges, for a growing millennial student community at UNSW Business School. We tested innovative and yet professionally relevant learning and teaching approaches like Lego Serious Play and Design Thinking (see figure 1) to project work and assessments in several undergraduate and postgraduate subject. With new technologies, new certification obtained through project funding and new partnerships with industry practitioners forged (e.g. Woolsworth, Amadeus, Wattleblock, SAP, Deloitte, UNSW Kirby institute) during the last two years, the project was able to empower students creation of knowledge with information technology (IT), and to overcome rote-learning, passive nature of teaching approach and poor self-directed E-learning pedagogy (or a lack of) whilst leveraging on academic and industry partnerships and instructional material.

![Figure 1: Lego Serious Play and Design Thinking in Technology Enabled Classrooms](image)

Testing in undergraduate programs including INFS2621 and INFS2631 included the first ever integration of technology-enabled classrooms that harvests the affordances of immersive and playful practices through technology, to enhance knowledge creation and the learning experiences of a new generation of millennial learners, who have a greater tendency to be more technology savvy, independent and innovative.
This new approach gives us the opportunity to design, develop and deliver an innovative and engaging educational experience that enhances/supports students’ creation of knowledge and design solutions through experiential, immersive and playful learning activities (See photos below for aspects of our experiential and immersive learning design). The project has also seen new relationships developed with Design X initiative by Professor Ilpo Koskinen, Carlos and The Lab for Innovation in Technology for Education, Australian Institute of Human Rights, and the UNSW Business School Work-Integrated-Learning (WIL team) to improve quality of teaching and learning across the university.

In particular, the project funding allows us to develop new Virtual World / Virtual Worlds for education and Virtual Reality (VR) for education to allow students to build awareness of the unintended consequences of technology adoption and business growth (Figure 2). In exploring new educational opportunities provided by emerging technologies, various VR Learning prototype apps were designed by INFS3605 (Capstone Project) students using VR (Oculus) hardware purchased through the SEIF grant. In addition, the VR app developed and reported in Mr Gavin Chiem’s honours thesis also received the university medal for outstanding research. The study was the first student project to make use of the VR facilities provided by the Business Experimental Research Laboratory (BizLab) at the UNSW Business School. The aim of this design project was to explore the use of e-learning tools for business ethics in higher education. Specifically, the research study set out to design, test, and evaluate a virtual reality (VR) simulated task, aimed at eliciting empathy through role-play, as a means of contributing to students learning outcomes in relation to business ethics. This research project utilised an experiment to address the research question of whether the VR game developed is seen as engaging and enjoyable experience and whether an ethical VR experience increases empathy in the user. Project funding was also used to investigate the unintended consequences of technology use on mental health and well-being in Japan. This aspect of the project have a major impact on developing student awareness on supply chain issues and human rights.

<table>
<thead>
<tr>
<th>Feedback from Student Joshua Ng</th>
<th>Feedback from Marc Cullen, Woolsworth, Dec 2018</th>
</tr>
</thead>
</table>
| "Hi Felix and Vincent, Thank you for the opportunity to present our findings in front of Woolworths on Friday! This semester has truly opened my eyes to the post-uni work environment, being placed into groups and working towards resolving real world issues or analysing actual, real world market trends. The hands on experience we have received over the semester is truly invaluable and the life lessons we have all learnt from this project" | Marc Cullen, Woolsworth

"Hi Vincent and Felix. Thanks for sending this through. Both Phil and I were very impressed by the professionalism demonstrated by the students in terms of their presentation skills and the insights they were able to glean from their analysis. They all showed a strong grasp of the data provided. What we both felt stood out however was their ability to think outside of..."
The projects’ developed instructional material, hosting of demos, provision of instructional material and classroom activities, as well as recommendations for both school and faculty. This project has been effective in building the academics’ experiences in delivering technology-integrated learning and the longstanding principles and effectiveness of the experiential pedagogies to support learning. The changes in classroom pedagogy consists of several components including flipped learning, agile methods, design thinking and serious play, unintended consequences of technology use, all of which have been identified in literature, and are known to the research team, as effective components for student ideation and problem solving projects. In the pictures, we illustrate aspects of our project team’s experiences and how our experiences inform an integrated approach to experiential learning and knowledge creation.

2. Dissemination strategies and outputs

Immersive technology and serious play approach have been implemented in a number of undergraduate and postgraduate courses in UNSW Business School. The integrated approach is based on the project team’s experience of student-centred teaching pedagogies into new learning spaces at UNSW and introducing innovative design thinking and agile scrum within current INFS undergraduate and postgraduate courses (e.g. INFS3605, INFS2621, INFS5621). Our approach brings together concepts currently introduced individually in INFS2621 (design thinking) and INFS2603 (agile). The student-centred approach to learning facilitated by flipped classroom spaces (for example G26 and G21 in the Business School) and the introduction of the proposed technologies and practices into these spaces has been effective in providing a more enriching and holistic, and immersive teaching and learning experience. As a result, course delivery has benefited from both agile and design thinking, play and games, relating to the emergence of serious play and gamification of learning and work practices. The effectiveness of serious play and gamification of in achieving educational outcomes has been experienced within UNSW Business School. Our UC/PG Enterprise Systems course (INFS2621 and INFS5621) has greatly benefitted with the incorporation of Lego Serious Play with the ideation process in design thinking as a new form of engaging students.

Similarly, agile scrum practices, used in INFS3605, incorporating ‘sprints’, roles such as ‘scrum masters’ and product-owners, the engagement in team ‘ceremonies’, ‘scrum poker’ sessions, etc. have been adopted in classrooms. The adoption of design thinking and agile methods by educators in classrooms sees knowledge creation by students as a process that begins with the encountering of challenges or problem in the real world. This approach to learning is grounded in the concepts of “solution-based thinking” and “iterative and incremental” work cycles, derived from design thinking and agile scrum used in information systems development. A design thinking approach aims to produce artifacts or ideas useful and meaningful to life, and leverages project teams comprising members with different skills and expertise in a collaborative environment for knowledge creation. The Lego Serious Play Method has emerged as means of fostering creative learning and knowledge construction in classrooms. Therefore, the final part of our proposed model is our engagement
with serious play as a tool for providing effective student engagement. Next generation virtual technologies and simulations are proposed as suitable tools for advancing the Lego Serious Play method in the classroom, and further explore information systems students use of innovative technologies for knowledge creation, problem solving, and collaboration.

The outcomes of our project has been useful as a series of case studies of how School/Faculty/University can achieve and develop (1) a blending of industry relevant practices, flipped learning spaces, and the creative use (and development of) of immersive technologies and serious play (2) a role-based and hands-on roadmap to improving the experiential learning environment and outcomes; and (3) a transferrable and professional approach, building on sound critical thinking and education principles. (4) supporting advances in the school’s engagement with emerging classroom technologies. For the university, this project develops a learning model that has broad applicability to range of contexts beyond the business school programs. The application of our integrated approach can exist across a broad range of UNSW curricula that espouses data analysis, project management, strategy and process design, and decision-making. The project outcomes will be innovative as it fully utilizes an IT-enabled and increasingly digitized classroom environment, while being grounded on sound educational and design principles. The project also considers students’ ability to engage with new technologies, and undertake professional roles, while leveraging on effective team collaboration and instructional materials and new technologies available. The project creates a ‘mixed’ learning environment through VR that furthers the experiential and collaborative problem that furthers the experiential and collaborative problem-solving work among students.

3. Evaluation of project outcomes

The project yield several outputs, formative and summative actions and evaluations. These include the following:

- We have developed preliminary instructional manuals, slides and additional case study material on our integrated approach to serious play and immersive technologies into the flipped classrooms, with detailed step by step procedures for each week, and/or relevant class discussion videos, examples, case studies and sample student problem solving solutions. These manuals will guide students’ activities for example taking on different roles for problem solving, collaborating using different immersive technologies. The instructions enhance how serious play, design thinking and agile methods would be used in the flipped classroom environment. Creating the manual requires organizing a focus group with leading industry and local experts. This will benefit a solution implementation in class, and refine the lessons learnt via initial experimentation and demoing of new technologies. All members of the project team assisted in the design and teaching of the materials, demoing of technologies, data synthesis and the dissemination of the findings of the project.

- Course Redesign and refinement of New UNSW Teaching Format (3 term) for serious play and immersive technologies based on review and feedback from project. We also followed with an introduction of integration approach and new technologies across INFS courses. We have adjusted existing curriculum to include experimentation with experiential learning of design thinking and agile scrum practices through serious play. Once the implementation of serious-play technologies and practices in the initial UG course has been successfully operationalised, further INFS courses (such as INFS3605) will be included to introduce innovative engagement with VR and HoloLens devices (microsoft hololens 2 developer devices are set for release later in 2019). Once those courses have been successfully integrated, then courses across the Business School, at both UG and PG levels will be pursued for involvement. We will consolidate our final results in designing, delivering and experimenting with our integrated approach via refined instructional material to be shared with other academics of the school/faculty and university. In the interests of contributing to the knowledge in the discipline, we will be sharing our results at learning and teaching development workshops such as the business school learning showcase as well as journal outlets.

- Model evaluation and approach validation with students, academic and industry experts were conducted. The research team and the research assistant liaised with academic and industry experts to organize a series of workshops to validate the learning models and use of the technology and required instructional materials and the roadmap. In addition, testing and experimentation with the proposed learning activities (Lego Serious Play) and VR technologies was conducted using an iterative approach (Agile scrum). Regular team meetings were held during both stages of the project and the team communicates regularly to advance the projects outcomes.

- From the technologies purchased from the grant awarded, a number of prototype VR learning applications have been designed, many through student 'agile teams' teams. Screenshots from these prototype apps are presented in Figure 4 below, with video links provided. Through iterative cycles of development,
students designed and built a series of VR apps for Oculus Go VR headsets. These apps include VR experiences for testing student knowledge on Networking, Java, Careers, Agile Ceremonies, Complex INFS topics (such as Business Process Management), as well as ‘virtualizing’ traditional text-based case studies into virtual experiences.

![Sample pictures of deliverables from project and student VR prototypes](image)

Examples of educational prototype VR apps developed:
- Edu VR App: [Video](#)
- VrCareer App: [Video](#)
- Atreus Quiz App: [Video](#)
- VR Stand-up App: [Video](#)

Internal evaluation for real-time feedback from Socrative helps us keep the project on track. The project team has extensive experience with using Socrative to gather feedback. Feedback received via ‘my experience’ and external evaluation will be sought through a series of demos and email consultations of the integrated approach throughout the project. The long-term impact of the project will be measured on its success in refining the experiential learning process through our integrated approach, evaluation of students’ experiences, and providing a learning model (including materials, activities, and technologies) that can be readily adopted by other courses throughout UNSW. The UNSW focus areas and priorities stated in enhancing student experience and incorporating technology suggests a climate of readiness for change in relation to our integrated learning project. Please see Figure 3 for sample feedback from student and industry.

Overall, the project brought about new knowledge, student resources, citations and adoption by others. For team members, the project enriches their curriculum and integrates technology into the classroom, to be creative for course planning and delivery, and to improve teaching quality. For students, the project outcomes not only
expand their learning perspectives, but also help them master skills and the tools to participate in a society where problems are increasingly complex and nuanced understandings are vital, leading to student learning experience improvement. In terms of spreading the word, we adopt local and global strategies to engage with stakeholders and ensure that the project remain impactful. The investigators will continue to share results of the study at conferences, for the purpose of further expert validation, feedback, citation and adoption from the international community twenty-four months’ post-completion. We anticipate no barriers to achieving change in our project at this stage.