

# **ANU Teaching Enhancement Grant**

**Building the Professional: Using Lego® Serious Play™ processes to enhance metacognitive practice in postgraduate learning environments.**

**Project Report**

**2018, Round 2**

**18/06/2019**

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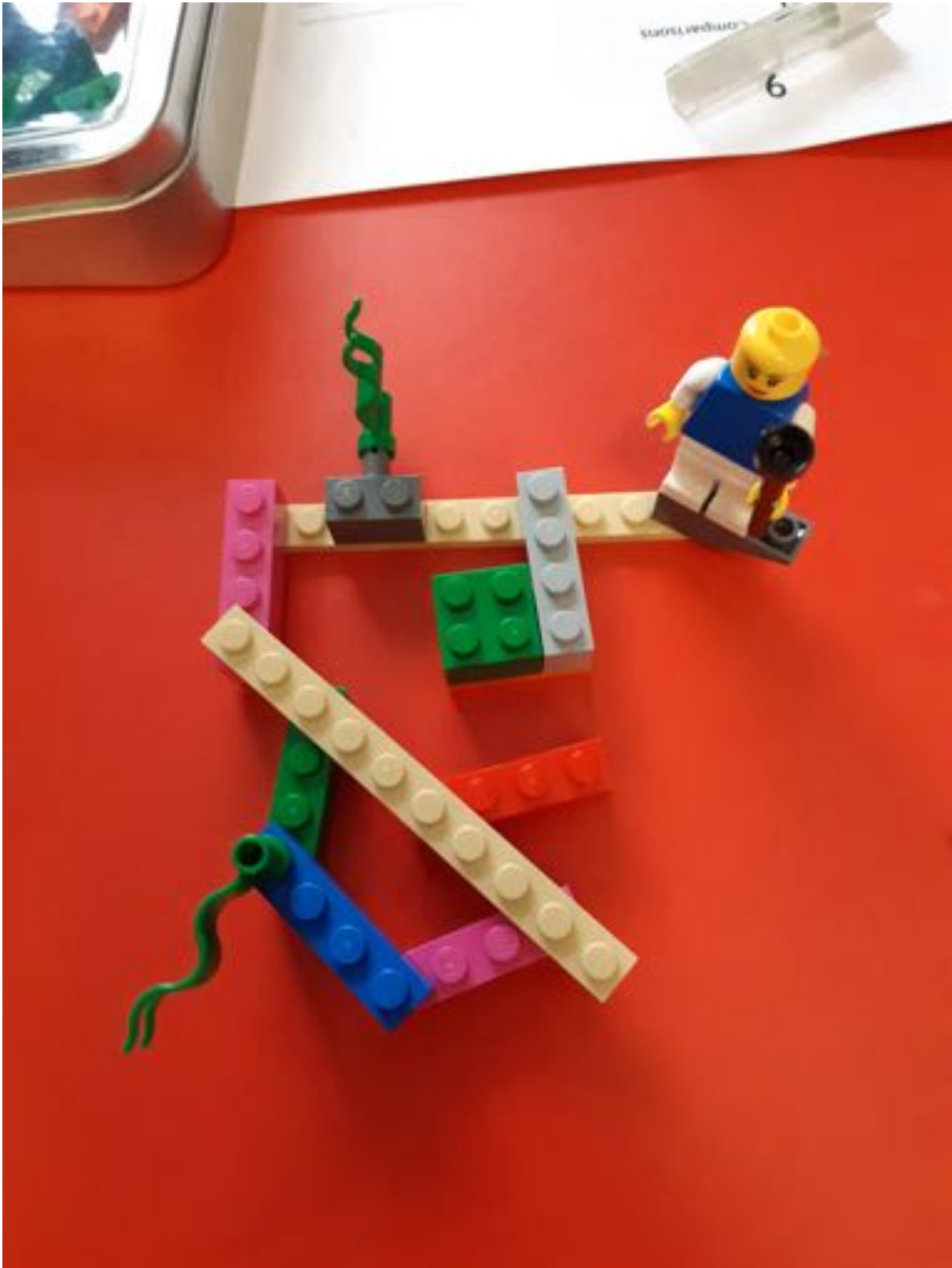
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Image 1: The Lego Serious Play Learning Journey



# Section 1: Review

## 1. Project Summary

“Building the Professional” is an interdisciplinary collaboration between the College of Business and Economics (CBE), the Centre for the Public Awareness of Science (CPAS) and the College of Engineering and Computer Science (CECS). Over the course of multiple semesters, we tested a selection of teaching interventions based on Lego Serious Play (LSP), Design Thinking, and professional skill development.

We ran the two planned classroom-based activities in Semester 2 2018 facilitated through LSP to introduce Master of Engineering and Computer Science students to the concept of creative problem identification and creative solution generation. By using the LSP process, we were able to present a learning environment where students could use visual metaphor to explain their understanding of core concepts associated with their assessment tasks. In the first intervention, we used the LSP protocol to explore shared meaning within project teams to ensure goal alignment for the semester. In the second intervention, we used LSP as a starting point to ideate multiple possible solutions of the real-world project challenge which we iterated later through a Design Thinking Workshop, to guide students from initial ideas to early prototypes.

Across the workshop series, student outcomes included improvements in problem solving techniques, group alignment and intra-group communication, along with client-student understanding of shared problems. The LSP interventions developed individual capacity and practiced professional skills, values and attributes in ways that critically complemented their technical expertise. Students learned mutual respect and how to work as a team and listen to each other. This was sound groundwork for group discussion, knowledge sharing, problem solving and decision making.

We experienced an increased uptake of problem identification and problem-solving activity and were better able to identify low level barriers to assessment progress— particularly in team shared understanding of the project task, and where individual solutions did not match up with assessment requirements. A strong outcome of the LSP was the impact on individual behaviour in relation to team performance where we were able to identify issues with teams at both individual and group levels surfacing through interactions in the workshops.

Our experience shows the value of using the full LSP process as a means to initially form shared understanding in assessment teams around their core assignment process, and the value of separating introductory exercises (team bonding) with advanced exercises (solution workshops) for student experience. We also gained insights, to be further explored, into how to use LSP with Design Thinking to achieve workshop goals.

## 2. Activities, outcomes, deliverables

Our team promised four deliverables – two teaching events, and two sets of supporting materials based on evidence led development techniques. In 2018, we delivered the two teaching interventions to the same student Master of Engineering and Master of Computer Science cohort (Semester 2, Week 3 and Week 6), along with the development of supporting curriculum material focusing on the development of active listening, negotiation skills and team building. We also produced two sets of LSP teaching interventions – a team-based ideation process and a project alignment process.

### 1. *In-class Lego Serious Play Event #1: Ideation Process (Teaching Week 3, Semester 2, 2018)*

We conducted 8 tutorials in Week 3 of Semester 2, 2018 for the ENGN8260 COMP8260 Professional Practice 2 course. Tutorials consisted of a workshop, featuring the introduction of the LSP concept, and training in the use of Lego as a communication medium. The engineering and computer science students were working with an industry partner on their real-world challenge. During the Week 3 tutorials, the industry partners attended the LSP workshops, and participated in the Lego activity in order to be able to lead off discussion in Step 5. All the participants engaged in five rounds of Lego Activities.

1. Warm up activity: Participants created a small model tower, which they used as the basis for introducing themselves and their model to their project team members (see Image 2). Project teams were formed in Week 2 and the Lego re-introduction phase was a social bonding activity for the teams.

Image 2: The Tower Warmup Exercise



2. Metaphor Practice: The second phase involved participants learning how to use the LSP story telling approach, through the creation of a pre-existing model from a choice of designs, which is then modified into the builder's own design to be used to explain an answer to a shared ambition question "What does success in this project look like?" (see Image 3). Participants were also introduced to the indirect questioning process used in LSP where participants phrased questions through the model to ask about parts and pieces in order to provide the storyteller with more opportunity to share details of their model. This approach is deemed as non-threatening as it places important focus on team members to explore the contribution of the model rather than on the person itself.

Image 3: The Lego Metaphor Workshop Activity from Teaching Week 3





4. Shared Understanding: At the end of the individual understanding round, participants were asked to create a shared model of their collective understanding of the team's problem to be solved. Emphasis was placed on not moving to solutions at this stage, but rather a collective understanding of the assignment topic challenge. All teams were provided with a new 16x16 Lego baseplate to use to create a model of the shared problem (see Image 5). We emphasized that all participants must be able to see their contribution to the team model, so that it was a shared view, rather than majority vote, or leader-takeover style of "my solution is now your solution".

Image 5: Team Problem Recognition Model



5. Problem Presentation: Starting with the industry client (green baseplate), all participating teams were given 1 minute to present their model to the audience (see Image 6), pointing to parts and pieces as required, to explain their interpretation of the problem to be solved. This was to share understanding of the problem within the tutorial, as all members of the same tutorial were working for the same client. It also encouraged exposure to a wider range of views than just the individual or group perspective. In other words, through this story telling process, teams were encouraged to see things from the eyes of their clients and from other teams and members.

Image 6: Workshop Team Model Presentations





6. Collaborative Problem Understanding: Following the presentation, each team was invited to locate their “view of the problem” model in proximity to the same or similar aspects of the problem presented by either the client, or previous teams (see Image 7). The session concluded with a debrief and review of the shared insights, both from facilitator and industry partner.

Image 7: Group Collaborative Problem Discussion



## 2. In-class Lego Serious Play Event #2: Project Alignment (Week 6, Semester 2 2019)

Session 2 was an iterative process of solution modelling to confirm shared understanding of the solutions generated to be used in validation interviews and stakeholder conversations (see Image 8).

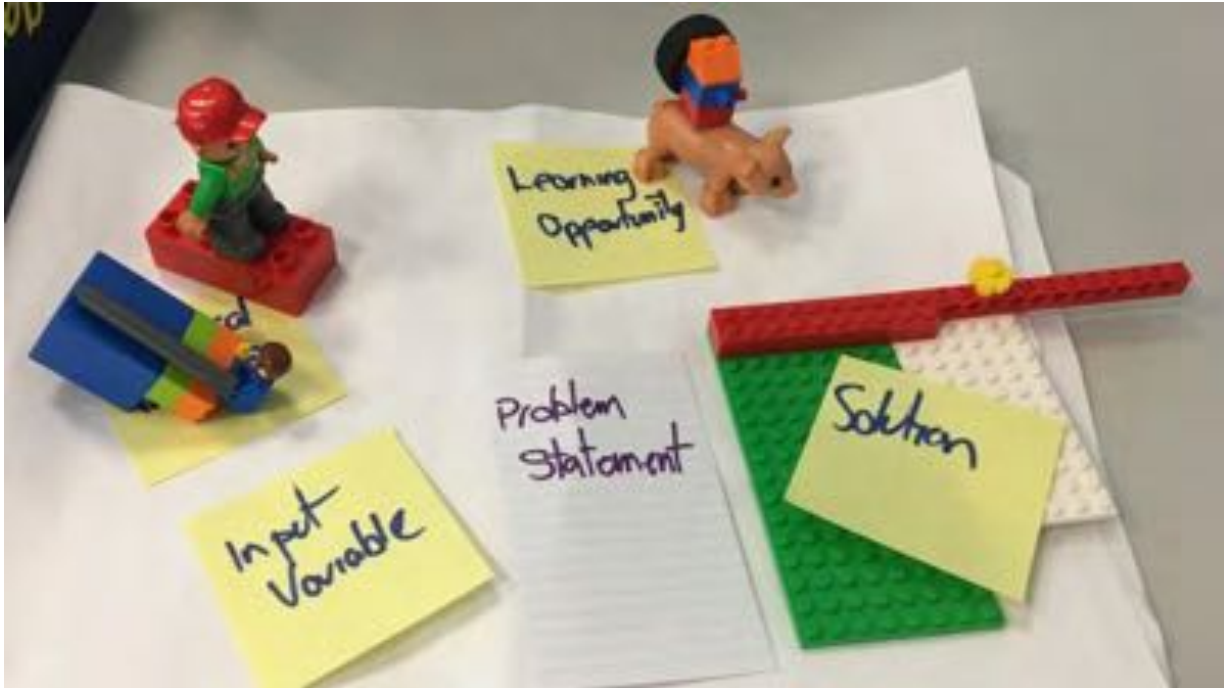
Custom class exercises were developed for delivery to maximise the value of the Lego as a tool for discussion, idea surfacing and agreement testing (Appendix 1). This process involved groups using multiple LSP models from the provided kits (20kg Lego Base Build Kit)

Image 8: Ideation Processes in Lego



As part of the ideation process, students engaged in a transformative procedure of converting the LSP story models into Design Thinking ideation notes which were thematically grouped (see Image 9). All of the project teams then engaged in a collaborative peer review process that encourage each team to share their solutions, contribute additional ideas and critique initial concepts based on their value proposition. At this stage, teams were also asked to justify their proposed solutions and defend their propositions. Clients were also actively involved in this review phase, giving directed feedback to the project teams on the top voted or most popular ideas. This agile approach allowed for immediate iterative feedback on early prototypes, allowing project teams to gain greater awareness of potential solution possibilities.

Image 9: The Exemplar Template shown to students on screen



### 3. Evidence Based Teaching Tool

We developed and tested the workshops using evidence-based teaching. Pre- post-test evaluations were implemented during the LSP workshops. This posed a challenge, given the time frame, and the amount of exercises that were needed to be completed within the 2-hour time limit. We found preliminary evidence to support positive changes in self-perception of creativity, self-reported self-confidence, and improved levels of shared understanding after students attended the workshops. On the basis of the feedback (qualitative and quantitative), we made refinements to the workshop design, including improvements in the level of preparation and pre-filter exercises to maximise the teaching and learning outcomes within the session.

We also established a two-part workshop structure to complement the Design Thinking framework. The Week 3 introduction to LSP workshop aligned with the Empathy and Define the Problem stages, and the Week 6 workshop focused on using LSP as a facilitative platform aligned for the Ideation, Prototype and Test stages. We developed two new presentations based on the integration of LSP and Design thinking, summaries of which are attached in Appendix 1.

### 4. Support Curriculum, Learning Materials and Lego Serious Play Student Classroom Guidelines

Both workshop session exercises resulted in the development of course and learning material templates to guide the inclusion and use of the LSP process in engineering and computer science (see Appendix 2). These were designed to respond to gaps in learning areas identified during the first set of workshops and to prepare students with skills needed to work with Lego. The learning materials were further developed to align with the PP2 curriculum and learning outcomes. The template design allows them to be used and adapted for other disciplines and future subject areas. The particular material targets the development of active listening, negotiation skills and team building.

## 5. *Written Outputs*

We created a number of written outputs and facilitated a number of exercises based on the workshop. We will also deliver a LSP workshop based on the TEG outcomes to the [2019 Playful Learning Conference](#) (July 10-12, 2019). Within the 12-month window of the Teaching Enhancement Grant (TEG), we delivered the following:

- TELFEST training workshop on the use of LSP for classrooms
- TELFEST presentation on the outcomes of the TEG
- Design Iteration Workshop in Semester 1 2019 using LSP and Design Thinking for ideation processes

## 3. **Lessons learnt**

Lessons emerged from the 2018/2019 use of Lego for tertiary education.

### **Lesson 1: Budget More Time for Less Activity**

We crowded as much into the workshop as 2 hours could permit, however, we encountered a range of time pressures, from students who had not adequately prepared for the LSP workshop activities, through to student who arrived late and classes that started late because of back-to-back scheduled tutorials – for example, if one tutorial ran five minutes late in a three tutorial sequence, that time was often recovered in cutting short activities in the third tutorial of the sequence<sup>7</sup>.

### **Lesson 2: Advanced Practice Requires Basic Induction**

In the 2019 class exercises, we encountered a problem while attempting to condense the two exercise designs (Week 3 and Week 6) into a single two-hour workshop activity – this highlighted the importance of allowing ample time in a LSP workshop for warm up activities to familiarise tertiary students with using Lego for educational purposes, particularly with this new mode of thinking (Creative problem solving) and new mode of learning (modelling objects in Lego). Although the teaching team were familiar with the LSP process, the students encountered a range of new challenges in parallel, and with differing degrees of enthusiasm for novel concepts. This experience may have been compounded by the language and cultural challenges that were impacting this cohort of students (see Challenge 5 below). We revised the design for Semester 2, 2019, to create a three hour workshop that combined both LSP training, and the development of preliminary understanding of the project challenges, which more closely aligned with the combined Week 3/Week 6 activities of 2018.

### **Lesson 3: More Hands Makes the Project Viable**

We integrated the TEG project with another supporting activity – the CBE internship program. This gave us access to four additional support personnel who could run a range of activities during the workshop sessions, including the management of data capture (video, camera, audio), and logistical tasks of clearing down the previous tutorial's Lego works, and setting up the rooms for the next round. We brought a large team to the operation, the addition of support staff during the deliverable events was invaluable, particularly for research data collection. Although seven people to a tutorial seemed crowded on paper, one facilitator, two observers, and four people to film aspects of the workshop made for a richer data capture experience.

## **Lesson 4: Scaffold Early, Scaffold Often**

A key piece of feedback from the student cohort in 2018 indicated students were seeing the different weekly activities as standalone or self-contained events. Within the workshop, some students would move away from the assignment task as the overarching goal for the session and focus on the Lego construction as the immediate task to be resolved. They saw the Lego as an immediate challenge to resolve, rather than a contribution to their assignment or other educational outcomes. This would lead to circumstances where the students would talk about the Lego model as a proxy or substitute for the assignment topic.

We also encountered students who had disconnected the in-class activity from assessment task development - a case of “Why are we not working on our assignments?” during the LSP activities designed to progress thinking towards the assignment. These students may have been experiencing language and cultural challenges that were impacting this cohort of students (see Challenge 5 below). This also manifested in the “Problem Identification” activity of the Design Thinking process where students would identify a preferred or familiar solution rather than engage in understanding the problem (e.g., “We will use blockchain”). This led to a level of tension between the exercise “Scope/Define the problem” and the student who believed that the problem had already been resolved because they had predetermined solution in mind.

A related challenge emerged during the iteration phase in the Week 6 design thinking, where resistance was encountered in a number of students who were reluctant to ideate multiple potential solutions for a project challenge. Students reported back feeling that introducing alternative solutions was akin to adding error to the process – their problem had a solution, and any solution beyond the first indicated failure or error. This was an unexpected discovery brought about as we were able to identify through the Lego models where students were selecting a “single problem, single solution” approach.

## **4. Challenges**

The challenges were faced in this project are outlined below.

### **Challenge 1: Deliverables in Multi-Tutor Environments**

One of the unexpected challenges from the project was the delivery window for the LSP interventions places high physical demands on the team. PP2 is structured to be supported by a multi-person tutorial team, meaning that clusters of tutorials can run over the length of a day, with a single tutor doing no more than four hours of classes in a row. However, as the LSP delivery team needed to deliver the workshop, we often finished a later class to back it up with an 8am start the next morning. Logistically suitable for multi-team environments may not suit a single person delivery design for drop-in education interventions.

### **Challenge 2: Needing the Same Venue**

A related challenge for the workshop delivery of a large, parts intensive teaching intervention is the need to control the operational space within which the workshop will take place with bump in / bump out times to enable set up, pack down and between session venue control. In 2018, having shift venue for the last tutorial also created a challenge of replicating the physical circumstance of the previous venue – the second venue had a less pronounced delivery space to for students to present their workshop ideas, the first venue lacked a level of flexibility of table space. For the 2019 iteration of the project, we controlled the single teaching space for the duration of the workshop sessions, which benefited both logistics, and providing a buffer zone between classes if we ran out of time

### **Challenge 3: Purpose Driven Lego / Connecting the Lego to Education**

Connected to the [Lesson 4 on Scaffolding](#), a clear and present challenge for using any platform such as LSP is that participants can disconnect the event in the room from the learning objectives of the lesson. Despite a layer of pedagogical scaffolding including defined learning objectives, session objectives and integrated assessment learning and teaching practices within the LSP exercises, some student feedback indicated that the novelty, difference and unexpected nature of the task resulted in the students not connecting the activity to assessment and course outcomes. The task itself needs to be tightly woven into the learning outcome for the session, and clearly explained to the participants in advance as to how it benefits them, why they will get value from it, and how they can act on the experience to further their coursework outcomes.

### **Challenge 4: Iterations from Experience**

No education plan survives contact with the students. We faced a repeated need to modify, iterate and revise the LSP teaching session design based on experience and immediate feedback from the prior session. For each workshop, the first class usually had the steepest learning curve, which effectively assigned the class the role of being a beta test or pilot test event. Similarly, not every iterative approach proved positive, as our 2019 redevelopment of the intervention relied too heavily on our own assumed knowledge of the point, purpose and value of the workshops, with commensurate experience and skills from 16 prior events. The resultant cut down workshop did not match the skills or background knowledge of the participants, and resulted in the need to return to longer, larger scale events to better meet the needs of the students and the teaching and learning outcomes.

### **Challenge 5: Language & Cultural Barrier**

The cohort of students we worked with was made up largely of international students, mainly from China (>90%), for whom English is not only a second language, but also a language which they are still getting used to as most of them had only been in Australia for one semester before taking the PP2 Masters course. We did not realise the extent of the language challenge until we were deep into running the workshops. This was further impacted by the use of interactive learning and teaching methods which were unfamiliar to this cohort of students. This meant that we spent a lot more time explaining the tasks so that students understood what they had to do, than we had anticipated from our experience with similar CBE postgraduate coursework interventions. We may also have surfaced an educational context clash where the ANU's "Many solutions to any problem" world view may not be familiar to the participants from their own prior international education backgrounds. This may be further exacerbated where students are coming from solution-based degrees such as accounting or mathematics, where single 'correct' solutions may have existed at the undergraduate level.

### **Challenge 6: Budget Allocations**

An unexpected side effect of Challenge 4 was the iterative learning processes, resulting in our respective research teams completing tasks below the time budget. For example, 20 hours was allocated for CBE research staff to assist in the repair and refitting of the Lego Serious Play hardware between Week 3 and Week 6, and all materials were restored to teaching grade standard within 14 hours. Due to the iterative process, and the experience of the Week 3 workshops, we also scaled back the self-reported data collections from our students, with the consequence of reducing our need for Research Assistant data entry and coding (46 of 80 hours schedule). We also transferred an additional 20 hours of workload to our curriculum development staff, based on the feedback from the sessions around needing greater scaffolding of the Design Thinking and Lego Serious Play outcomes in the PP2 course materials.

We also purchased a new set of Lego Serious Play Window Kits, and expansion materials to support future iteration of the intervention not needing to be dependent on the RSM's teaching and learning Lego stock.

## 5. Impact and dissemination

The LSP workshops provided the PP2 Master of Engineering and Computer Science students and Industry partners the opportunity to apply professional skills, theories and methods using creative problem-solving approaches to better understand assessment requirements and brainstorm multiple viable solutions to a real-world project challenge using Lego and Design Thinking. They mutually benefitted in terms of applying these innovation strategies to facilitate working relations and build professional confidence. This resulted in a greater ability for all participants to listen to each other and share ideas. These professional skills were developed in an the LSP environment using ground rules that helped students manage decision-making processes more easily and justify a feasible and viable concept of value to businesses and academia that considered both technical and user requirements. In other words, the format of the workshops allowed the students to engage with the client and others to validate ideas, receive immediate feedback and develop confidence to discuss and present low fidelity prototypes. For this largely international student cohort, the practical application of the LSP provided the chance to build upon individual capacity in a supported environment using creative non-threatening strategies to further develop professional skills, values, and attributes in a way that directly complements their technical expertise while tackling real world problems. These skills will help students in the future to perform effectively in the complex context in which engineering and computer professionals operate.

Dr Dann and Dr Lear both joined the ANU's Interactive Learning Project (ILEAP) in S2 2019 with the intention to also share learned experiences from the TEG project with ANU colleagues.

Project outcomes from the Lego Serious Play workshops have been shared within the global community through the Playful Learning Conference (July 10-12, University of Leicester), and in practice in the University of Lethbridge Lego Serious Play sessions (September 2018). Aspects of coursework integration, including the necessity for greater scaffolding of learning outcomes have informed subsequent LSP session designs throughout 2019 interventions within the RSM's MGMT1003 Management, People and Organisations course, MKTG2023 Services Marketing, and additional delivery of LSP workshops to student cohorts in the Tuckwell Scholar's Program.

## 6. Progression

In terms of the expected timeline, how far has the grant progressed?

%	10	20	30	40	50	60	70	80	90	100
										✓

## 7. What next?

During the workshops, we captured a range of rich quantitative and qualitative data which we are in the process of analysing for later publication. In Semester 1, 2019, we ran an iterative variant of the 2018 S2 workshops to trial a new method, and in Semester 2, 2019 we will test the fourth iteration of the delivery framework (3-hour single session). This will provide our team with understanding and experience across three different delivery formats (single problem identification event, split problem/solution event, 3 hours combined event) to be able to present alternative evidence-based education intervention options to other courses through the ILEAP Fellowships.

## Section 2: Acquittal of funds

Provide details of all expenditure associated with the ANUTEG funds. Expenditure should be reported in whole dollars, exclusive of GST.

Commentary on variance from the approved budget, and details of any proposed revisions to the budget should be included in your response to Item 1.4 (Challenges) above.

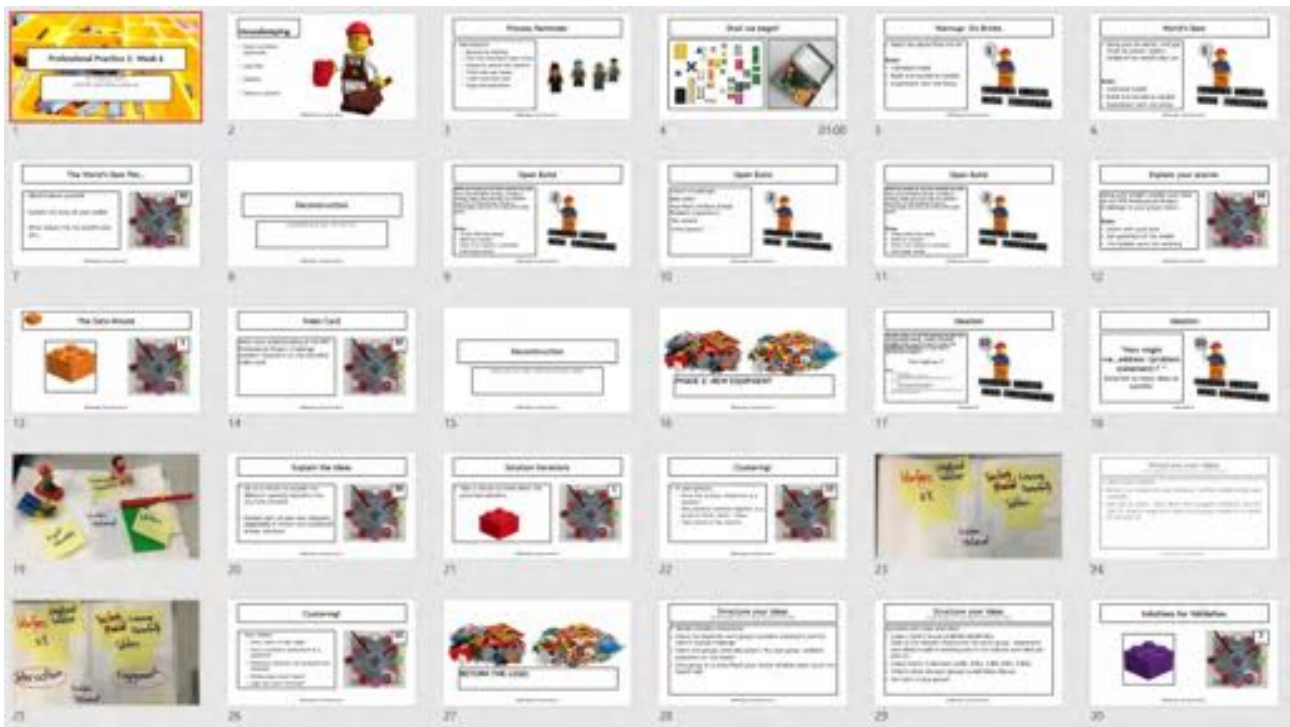
Budget Item	Approved budget	Actual per Financial System	Balance
<b>CBE Internship Project Student Fees (4 Internship students *\$500 internship fee)</b>	<b>\$2,000.00</b>	<b>\$2,000.00</b>	<b>\$0.00</b>
<i>Research Assistant 1 ANU5(1) 80 Hours (CECS Support) @\$57.275 / hour</i>	<i>\$4,582.00</i>	<i>46 Hours</i>	
<i>Research Assistant 2 ANU5(1) 20 Hours (CBE Support) @\$57.275 / hour</i>	<i>\$1,146.00</i>	<i>14 hours</i>	
<i>Lego Serious Play Curriculum Materials Development @ 30hours (Sessional payment where the staff member possesses relevant doctoral qualification \$57.275/hour)</i>	<i>\$1,718.00</i>	<i>50 hours</i>	
<b>Salary Total</b>	<b>\$7,446.00</b>	<b>\$5,943.18</b>	<b>\$1,502.82</b>
<b>Supplemental materials for Lego serious Play workshop (booklets &amp; surveys, replacement Lego parts)</b>	<b>\$300.00</b>	<b>\$94.45</b>	<b>\$205.55</b>
<b>Budget Variation: TEG Performance Lego</b>	<b>\$0.00</b>	<b>\$1,076.69</b>	<b>-\$1,076.69</b>
<b>Total Budget</b>	<b>\$9,746.00</b>	<b>\$9,114.32</b>	<b>\$631.68*</b>

\*\$631.68 will be returned to the ANUTEG funds.

Add extra rows to the table as required.

Unspent funds are to be returned to the Promoting Excellence team to be used in future grants rounds.





## NEGOTIATION SKILLS

### How to create win-win situations...

Today, you learnt negotiation when you...

**Actively listened** as a means to influence your peers to understand their points of view, worked to clarify peoples' goals and expectations, and set clear ground rules for collaboration.

**Facilitated discussions** to build consensus on the meaning of Lego models, building ideas together, and creating win-win situations for all involved whilst managing any conflicts that may arise.

**Clarified a clear way forward** by focusing on the value to be gained by achieving common goals to build the model, directly confronting any value differences, and being respectful of peoples' points of view.



### What is negotiation?

#### Facilitation of a healthy conversations.

- Before you can start negotiating a clear way forward, it is important to actively listen to understand everyone's points of view.
- To build a collaborative model you need to discuss ideas, clarify what you want to build, and come up with a way to work towards it.

#### Aligning goals to create win-win situations.

- Everyone can find different meanings with different models.
- Everyone's goals must first be clarified, articulated, and logically presented.
- The pros and cons of all options must be explored to develop best ways to achieve shared goals.

#### Implementing a clear course of action.

- Coming to an agreement requires expectations of people to be understood.
- Once people feel heard and that their opinions are understood, they are more likely to have buy in.
- Effective negotiators focus on creating win-win situations where the priority interests of all parties are met.

# ACTIVE LISTENING

Listen with all your senses...

## In this exercise you learnt Active Listening when you...

### Shared the meaning of success in the project

Found that sometimes a brick was just a brick, sometimes it meant much more.

Asked what was built, and why it was built. Gave full attention to the speaker and encouraged the speaker to keep talking.

### Explored the project problem to be solved for your client

Found that everyone can find different meanings in the same model.

Took time to share and explore thoughts and feelings to find meaning in your model. Compared your build to others.

### Positioned the group problem in relation to the client's view

Focused fully on the speaker – pauses and short periods of silence were natural. Were open to new ideas. Asked yourself "Why not?". Clarified by asking questions and reflect on the meaning of the message.



## What is Active Listening?

**Active listening** is the most fundamental component of interpersonal communication skills needed for professional practice.

**Active listening** is a conscious decision to listen with all your senses as well as give full attention to the speaker to understand the meaning of the message.

**Active listening** is to be empathetic and to remain neutral and non-judgmental. Do not take sides or form opinions, especially early in the conversation.