Transforming engineering programs with Studios

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What do you want to get out of today?

What does success look like for you?

Agenda

1. The story of our **Summer Studios** (using **Design Thinking**)
2. What are the **challenges** of curriculum at TUB for **students** and **faculty**
3. Define the **outcomes** in one of your subjects – know, act, be
4. Design a learning **activity** for a studio
5. Consider how you would manage **engagement** and **feedback** – the semester plan
6. How might you ensure (and celebrate) **student success**?

Key requirements

1. **Technical** expertise (of course!)
2. Holistic, **systems** approaches
3. Increasingly complex and **multidisciplinary**
4. Privilege lifecycle and **societal considerations,** expectations and **trust**
5. **Problem finding** with stakeholders
6. **Digital** tools will be pervasive, enabling more **creative** work

Curriculum change

1. Better **integrated** curricula (focused on development of professional skills)
2. Collaborative and open-ended problem-finding and solving in multidisciplinary project teams (**society** + **complexity** + **systems**)
3. Greater emphasis on **digital design tools** and data analytics
4. stronger **industry** and community links in teaching.

Summer Studios – Lessons from a ‘small bet’ in curriculum redesign

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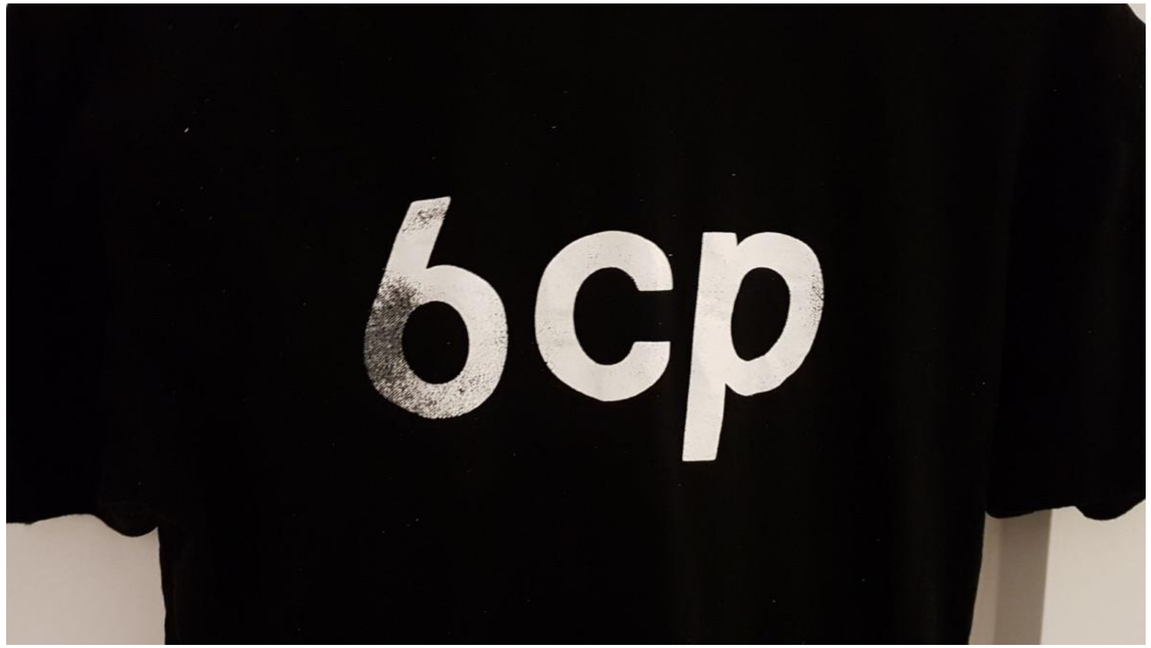
University of Technology Sydney

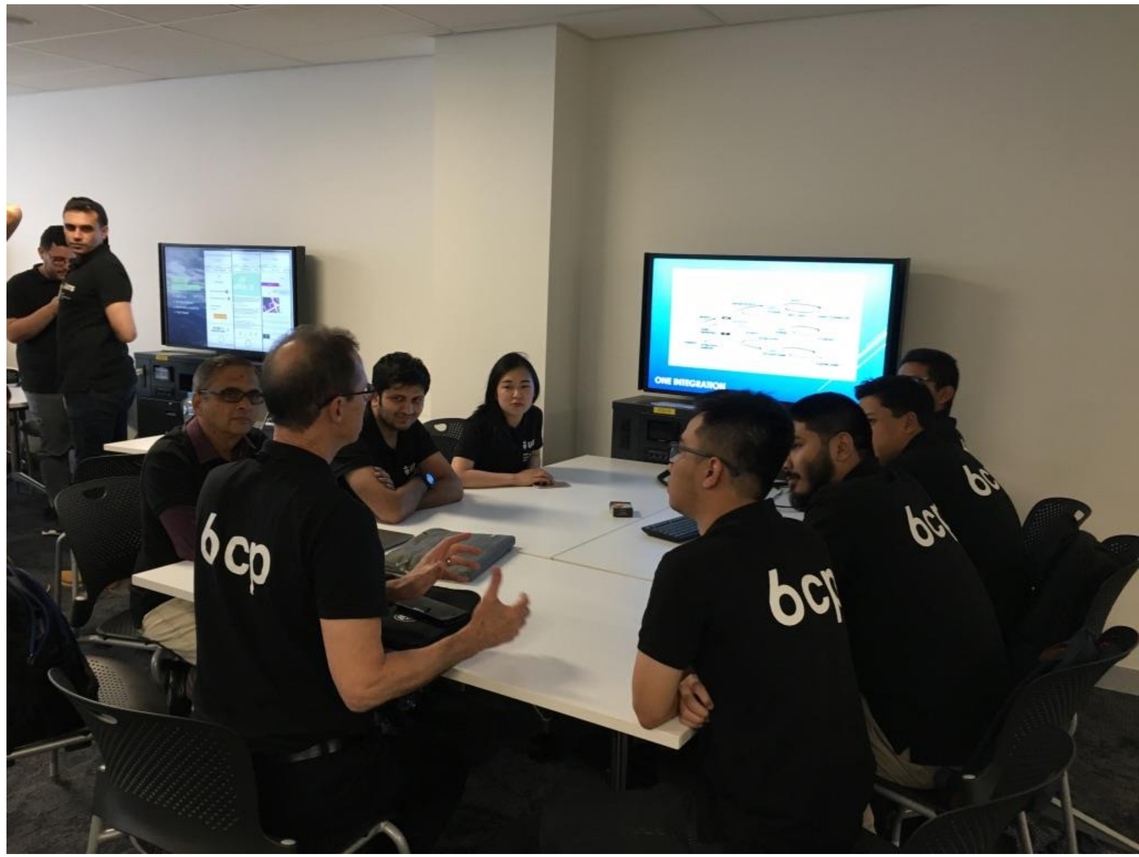
Intent – improve student learning, experientially

- *High energy, high collaboration, project-based*
- *Real-world design challenges*
- *Facilitated by academic experts, industry and students*

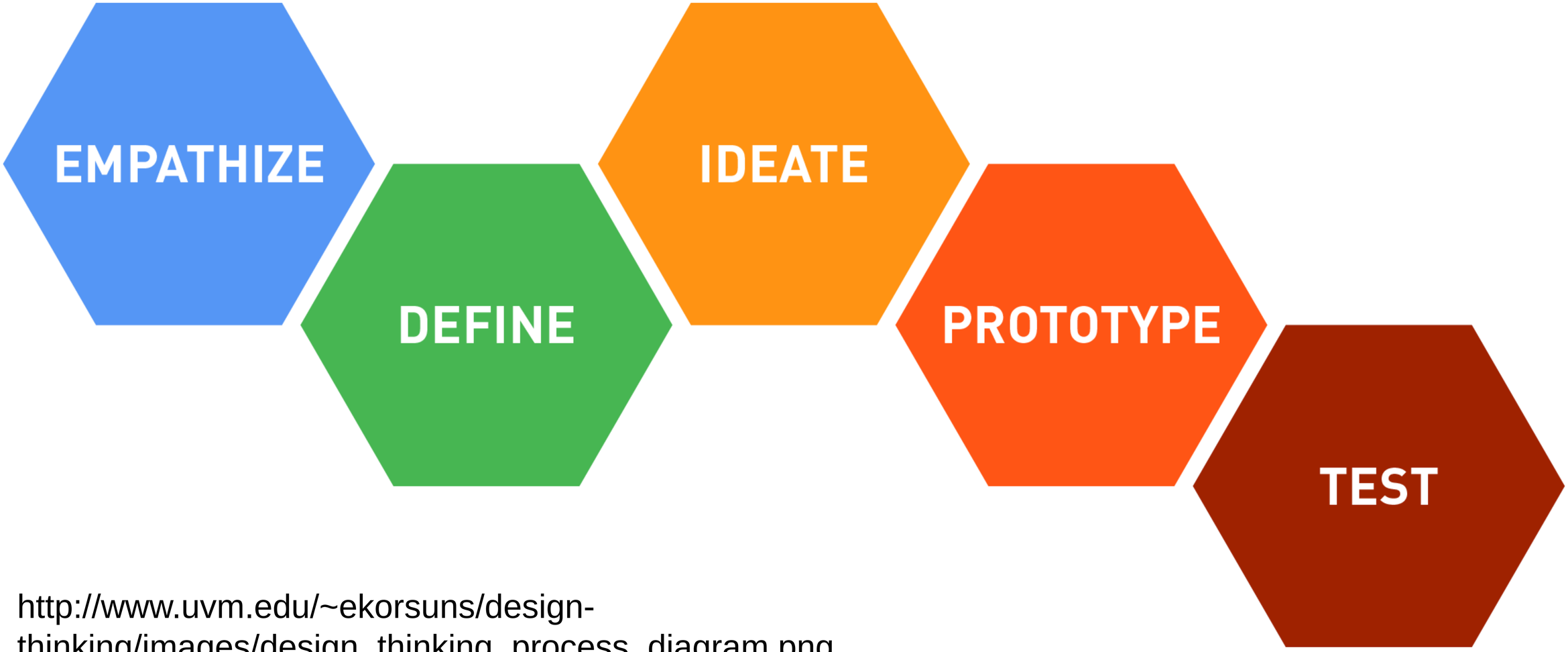


Overview

1. Run over **6 weeks**, mid-January to end-February
2. **Elective** for most students = 6 credit points = 25% of a semester
3. **165 students** + **13 topics** + 50 staff
4. **Training** for facilitators (see the SEFI paper)
5. Used **design thinking** as fundamental concept



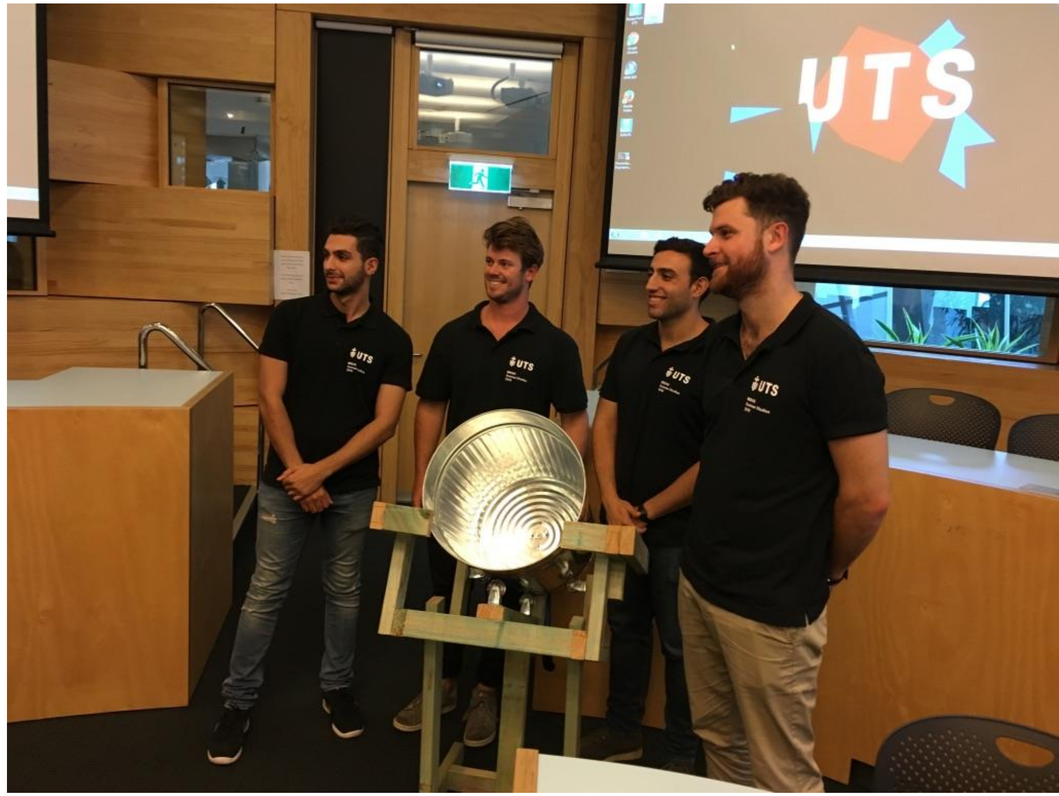
Design thinking



http://www.uvm.edu/~ekorsuns/design-thinking/images/design_thinking_process_diagram.png

Learning objectives

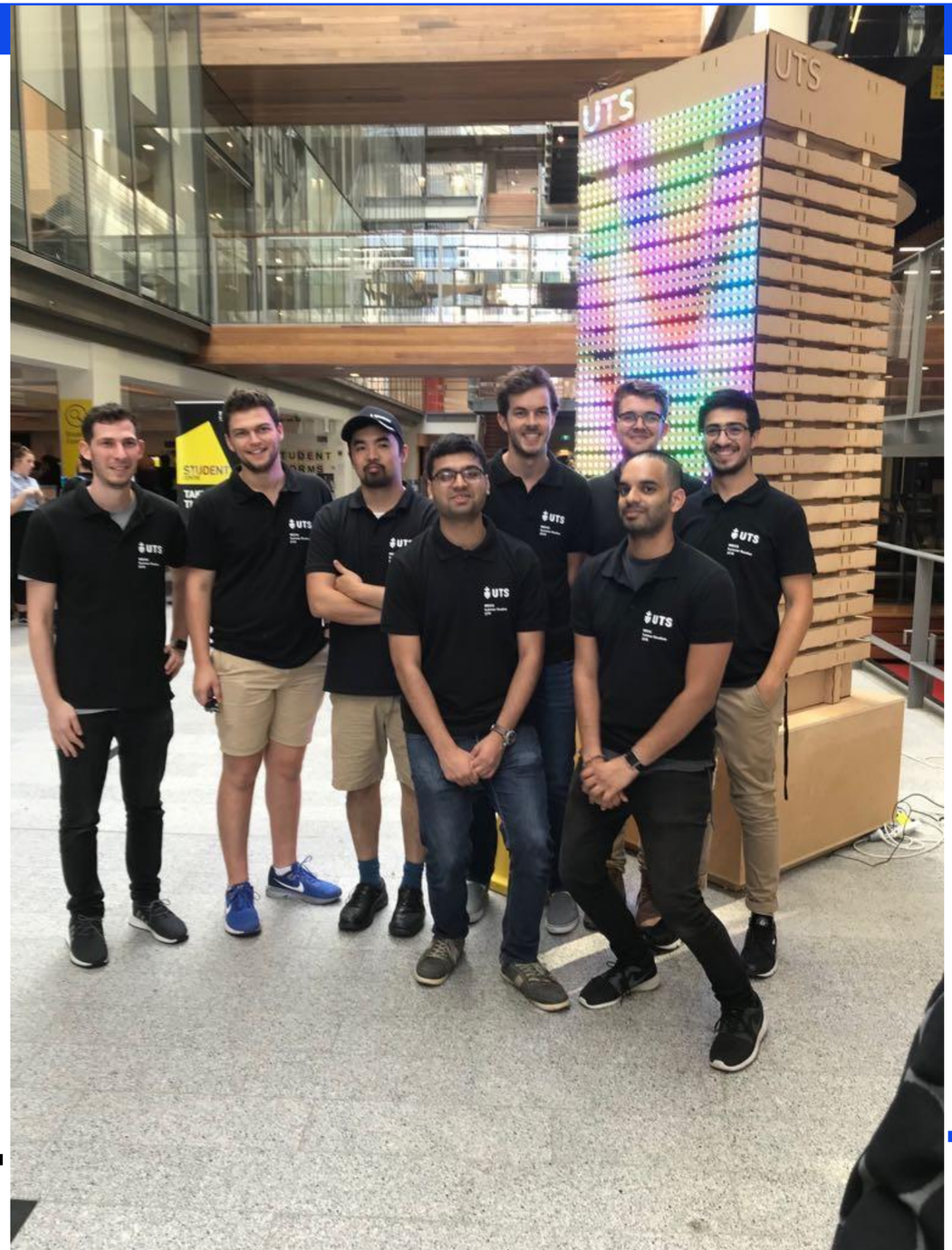
1. *Engage with **stakeholders***
2. *Apply **design thinking***
3. *Apply **technical skills***
4. *Demonstrate effective **collaboration***
5. *Conduct critical self and peer **review***



Humanitarian engineering – portable concrete mixer

Studio topics (selection)

1. Activating the **Smart City ***
2. **Humanitarian** Engineering *
3. **Data Science**
4. **Control** and Automation
5. **IoT** Project using Python
6. **Medical diagnostic** device
7. **Robotics** rehabilitation studio
8. **Vivid** 2018 *
9. **3D Printing**
10. **Aerospace** Challenge *
11. **Structural Engineering**
12. Innovation & **Entrepreneurship**
13. *** = student-led**



Agile ideas incorporated

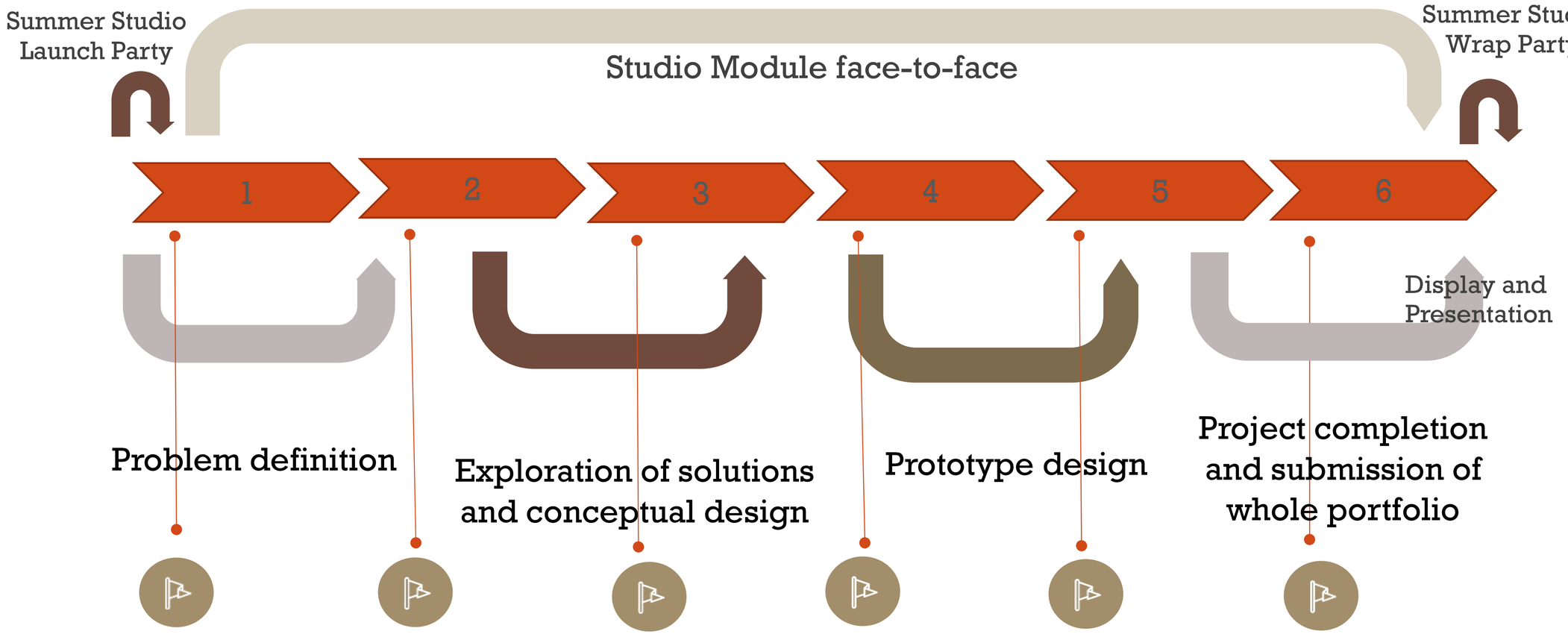
1. Divided 6 weeks into 3 x 2 week **sprints**
   - Regular feedback and critique
2. Staff **scrums** used to debrief and plan next steps each week
3. Student **mixes** used to cross-fertilize ideas between studios

Aerospace – deployable solar array

Agile project management

MIDAS SUMMER STUDIO IN 6 WEEKS

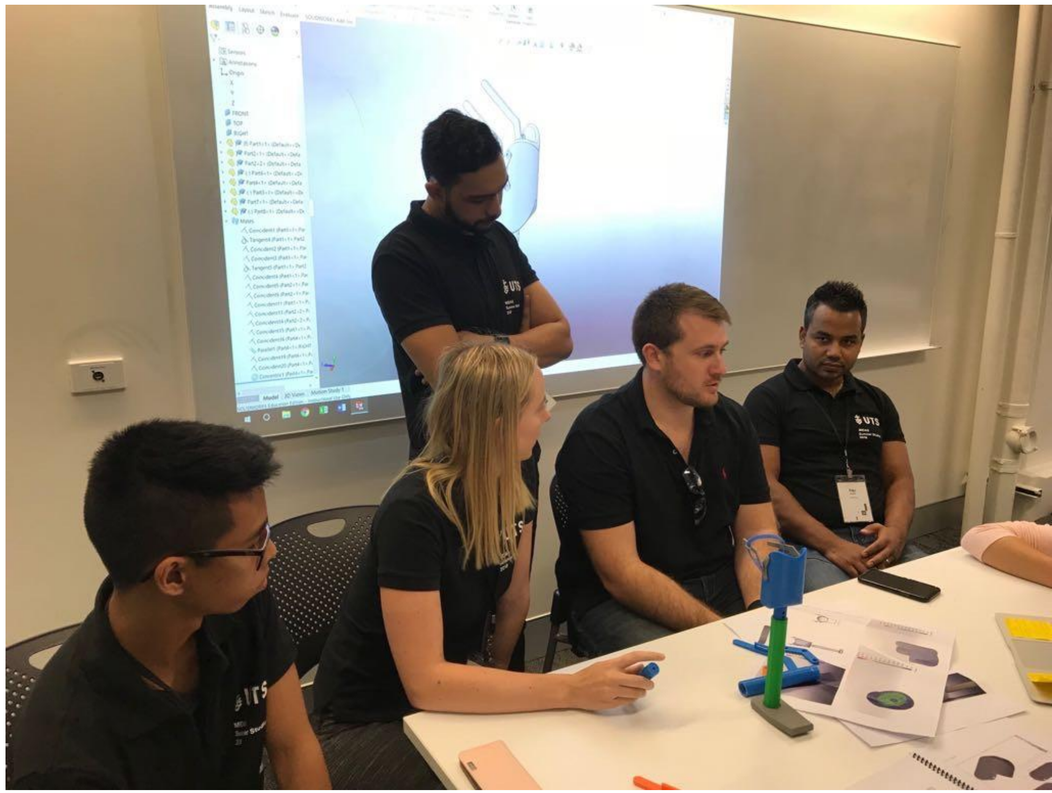
MIDAS = More Innovative Design Able Students



*Open ended scope, **freedom and creativity**. I liked how I had freedom to learn using my own practical experiences instead of a regimented assessment schedule.*

Insights

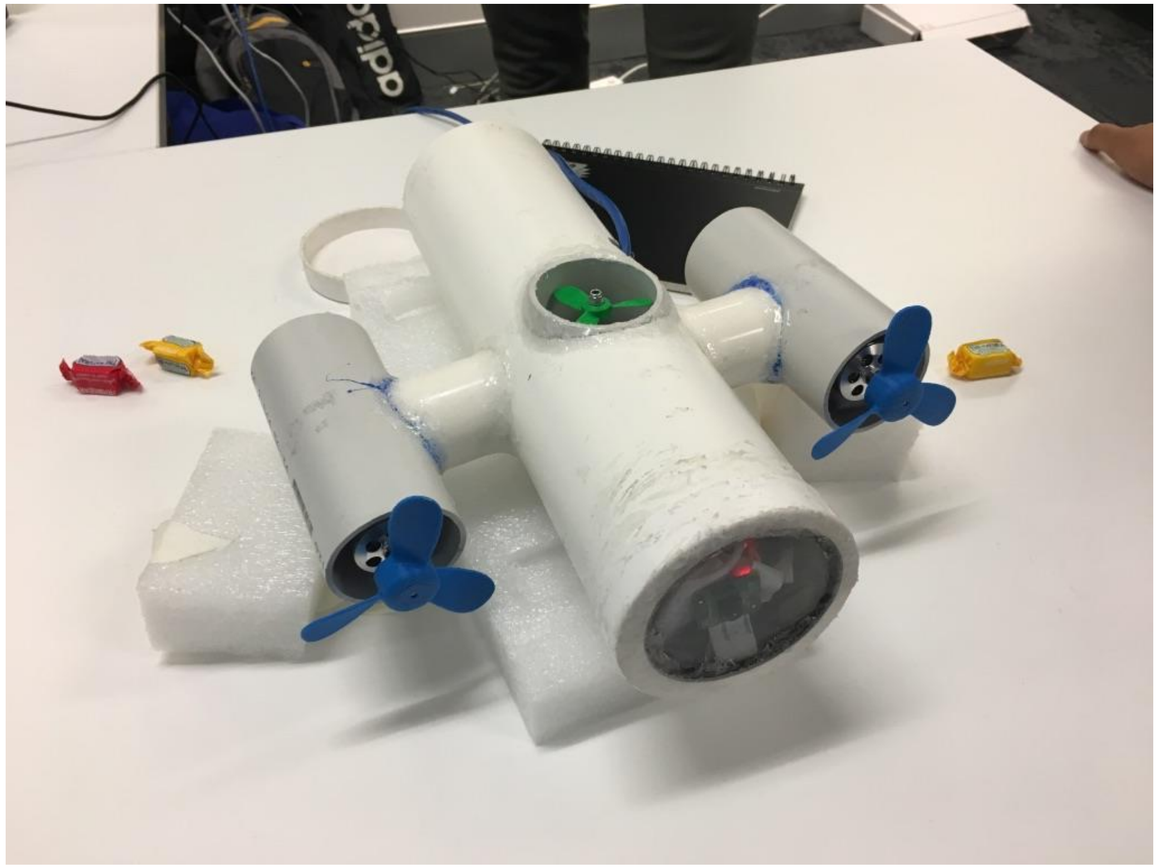
1. Better **scaffolding** was required
2. Students needed to be encouraged to **ask questions**! (better facilitation)
3. Students discovered **real teamwork** and collaboration
4. Confusion over their **portfolio** requirements



3D printing – assistive device

Outcomes

1. **Student-led** studios were most successful
2. Studios are a great **training ground** for new teaching approaches (low risk)
3. **Roll out of studios** across all programs is underway; We now have 80+ studio subjects!



IoT – remote-controlled submersible

New Mechanical Engineering Curriculum

First Year			Second Year			Third Year			Fourth Year			Fifth Year	
Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring	Summer	Autumn	Spring
Stage 1	Stage 2	Free	Stage 3	Stage 4		Stage 5	Stage 6	Free	Stage 7	Stage 8	Stage 9		Stage 10
Mathematical modelling 1	Engineering computations and modelling		Mathematical Modelling 2	24 week Internship		Design for Sustainability,Safety and Risk	Engineering Economics and Finance		Engineering Project Management	Entrepreneurship and Commercialisation	24 week Internship		Sub-Major/Elective or Mech Choice Studio
Physical modelling	Structural design A (simple systems)		Thermal/fluid design A (simple systems)			Structural design B (complex systems)	Advanced Manufacturing (B) (Industry 4.0)		Mechanical system dynamics, vibration, measurement and control A	Mechanical system dynamics, vibration, measurement and control B			Sub-Major/Elective or Mech Choice Studio
Engineering Communications	Materials and Manufacturing (A)		Design of machines and mechanisms A (kinematics)			Thermal/fluid design B (complex systems)	Design of machines and mechanisms B (kinetics and adv kinematics)		Sub-Major/Elective or Mech Choice Studio	Engineering Research Preparation			Sub-Major/Elective or Mech Choice Studio
Introduction to Mechanical Engineering	Introduction to Mechatronic Engineering		Mech Studio A (machine/product design)			Mech Studio B (Thermal/fluid system)	Application Studio A		Application Studio B	Professional Studio A			Professional Studio B (Capstone)
			Engineering Practice Preparation 1			Engineering Practice Reflection 1				Engineering Practice Preparation 2			Engineering Practice Reflection 2

Questions or comments?

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2. Review **Design Thinking**
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Empathise: Challenges at TUB (from your perspective)

- Students
- Staff
- Write ONE per sticky note (5-10 minutes)
- Aggregate and cluster
- Big ideas?

Stanford d.School’s Resources for Design Thinking

https://dschool.stanford.edu/resources/

You will use a Stanford template to quickly work through your partner’s problem to help them think differently:

1. **Empathise** – two rounds of interviews
2. **Define** the problem
3. **Ideate** some solutions, in 2 rounds
4. **Prototype** one solution
5. **Test** with your partner

Share, learn and comment

Design the Engagement

How will students engage in your task?

What will they need?

How will they get feedback?

What problems can you foresee?

How will you overcome them?

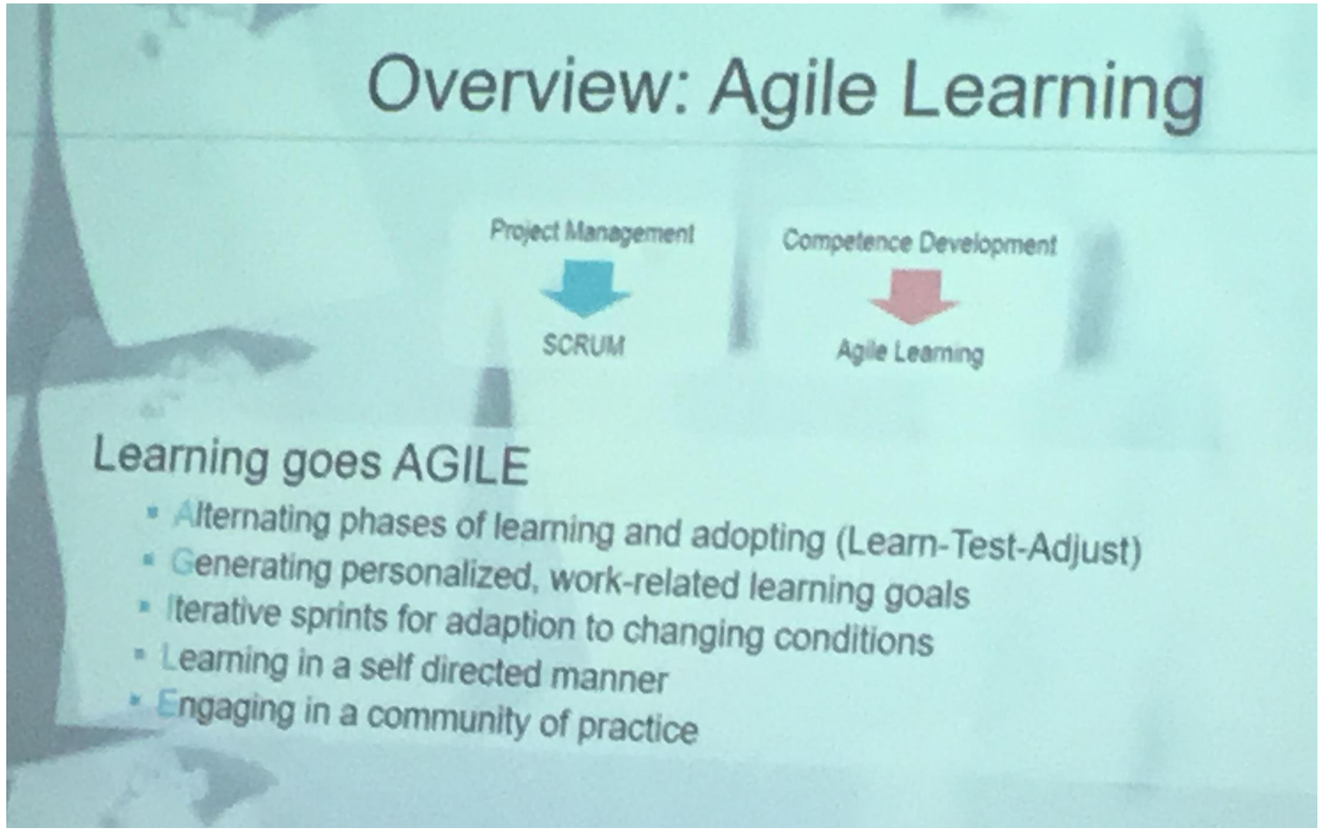
Agile Project Management

Key ideas:

- Sprints, scrums, action!

See Joerg’s slide from SEFI

1. Learn-test-adjust
2. Personalised goals
3. Iterative sprints
4. Self-directed learning
5. Engaging collaboratively



Acknowledge and celebrate student success

How?

Lessons learned

Questions, comments?

SPARKPLUS
Flexible Self & Peer Assessment and Feedback

Introduction

Welcome

Thank you for visiting the SPARK^{PLUS} web site. Please look around to learn more about SPARK^{PLUS}, including additional detailed information about it's features and pedagogical rationale for it use.

About SPARK^{PLUS}

“Group projects aren't fair” is a frequent student response in higher education. Group work is used to facilitate peer learning and encourage students to develop collaboration, crucial graduate attributes. Since assessment strongly influences learning, any course objective to improve peer learning and/or collaboration must have assessment that promotes it.

Self and peer assessment is a valid solution for promoting these objectives and overcoming potential inequities of equal marks for unequal contributions. Group members are responsible for negotiating and managing the balance of contributions and then assessing whether the balance has been achieved.

Over the last decade our focus in using self and peer assessment has changed from making group work fairer (something it does automatically with careful implementation) to using it to produce formative learning-oriented feedback to complete the learning cycle and encourage the ongoing development of skills. More recently we have found self and peer assessment to be a valuable tool to produce learning oriented student centred assessments, facilitate collaborative peer learning and to develop monitor and track students’ attribute development.

SPARK^{PLUS} is a web-based self and peer assessment kit. It enables students to confidentially rate their own and their peers' contributions to a team task or individual submissions.

View NEW resources for interpreting SPARK^{PLUS} Factors

Introduction
Welcome
About SPARKPLUS

Boards

Trello

Science Technology & the Future 2013

Personal | Private | DL 3

To Do

- Divide Website Frontpage up into a few webpages
- Find Venue for Conference
- Find Venue for Mixer Session
- Confirm Venue for pre-conference activity (Melb Uni Grad House?) DL
- Create ready to tweet / FB messages? promoting conference?
- Determine what networks we can utilize to help promote the conference
- Fill in possible gaps in conference schedule DL

+ Add another card

Doing

+ Add a card

Done

- Build website, basic verbage and images, contact form, graphic design and web host / domain management: http://scifuture.org
- Build Website for Confernece 1
- Create facebook open group for event: https://www.facebook.com/groups/344043225727469/

+ Add another card

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