SEG Information Session
Faculty of Engineering and Information Technologies

October 4 2016

Presented by
FEIT Education Innovation Unit
Introduction

Strategic Education Grants - 2017

Presented by
Associate Professor Peter Gibbens
Sub-Dean (Learning and Teaching)
Innovation question uptake? Q_11.

- “In this unit of study, the initiative to <up to 140 character description of innovation> has had a positive impact on my learning experience.”

- Engineers are supposed to be innovators ...

- S1 2016: AMME 0/54, CBE 0/30, CIVL 20/51 (Mean 4.16), EIE 7/39 (Mean 3.98), SIT 4/46 (Mean 4.5)

- Is this really a true reflection of how innovative we are?
Strategic Education Grants

— Inspiration – previous topics from FEIT and other faculties


— Key dates
  — 20 September 2016 - Applications for 2017 funding opens
  — 12 October 2016 – EIU Lunch and Learn – Discussion session about SEG and Innovation
  — 20 October 2016 - Information workshop for applicants
  — 3 November 2016 - Applications close
  — 14 December 2016 - Applicants notified of outcomes

— Small (up to $12,000) and large (up to $35,000)
FEIT EIU Strategic Education Grants

- **Strategic Education Grants funded by the FEIT Education Innovation Unit.**

- In parallel with the University [Educational Innovation](#), the [FEIT EIU](#) will support up to three additional internally funded SEG applications for Educational Innovation Grants (EIG’s) or Open Learning Environment grants (OLE’s) in the 2017 round. This provides additional opportunities for FEIT staff to secure a SEG project.

- Applications must be made through the [University Educational Innovation scheme](#). They must meet the same criteria and be of sufficient quality and innovative content to satisfy FEIT EIU objectives.
Paving the way for a truly integrated aerospace engineering curriculum

Educational Innovation Grant

Presented by

Dries Verstraten
School of AMME

THE UNIVERSITY OF SYDNEY
Motivation and Goals

Motivation

Contemporary engineering challenges require:

“the ability to make connections among seemingly disparate discoveries, events, and trends and to integrate them in ways that benefit the world community will be the hallmark of modern leaders” – Froyd & Ohland 2005

Goals

– set up a pilot program that will aid to develop an integrated aerospace engineering curriculum

– unite learning in various UoS using a common thread throughout the entire degree
Expected Outcomes and Approach

**Expected Outcomes**
- more engagement from students with lab activities and assignment
- promote deep learning through an interweaved set of experiential activities

**Approach**
- Develop lab and project-based learning activities
- Pilot trial with a selected group of students
## Methodology

### Experiential activities across a range of UoS

<table>
<thead>
<tr>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Engineering Computing</strong></td>
<td><strong>Intro to Aircraft Construct.</strong></td>
</tr>
<tr>
<td><strong>Intro to Aerospace</strong></td>
<td><strong>Maths</strong></td>
</tr>
<tr>
<td><strong>Maths</strong></td>
<td><strong>Materials</strong></td>
</tr>
<tr>
<td><strong>Integrated Engineering</strong></td>
<td><strong>Mechanical Design</strong></td>
</tr>
<tr>
<td><strong>Engineering Dynamics</strong></td>
<td><strong>Thermal Engineering</strong></td>
</tr>
<tr>
<td><strong>Instrumentation</strong></td>
<td><strong>Mechanics of Solids</strong></td>
</tr>
<tr>
<td><strong>Maths</strong></td>
<td><strong>Aircraft Performance</strong></td>
</tr>
<tr>
<td><strong>Fluid Mechanics</strong></td>
<td><strong>Propulsion</strong></td>
</tr>
<tr>
<td><strong>Aerospace Dynamics</strong></td>
<td><strong>Flight Mechanics</strong></td>
</tr>
<tr>
<td><strong>Aerospace Design 1</strong></td>
<td><strong>Aerodynamics</strong></td>
</tr>
<tr>
<td><strong>Aerospace Structures</strong></td>
<td><strong>Aerospace Design 2</strong></td>
</tr>
<tr>
<td><strong>Aero Elective</strong></td>
<td><strong>Aero Elective</strong></td>
</tr>
<tr>
<td><strong>Thesis A</strong></td>
<td><strong>Aero Elective</strong></td>
</tr>
<tr>
<td><strong>Flight Mechanics 2</strong></td>
<td><strong>Thesis B</strong></td>
</tr>
<tr>
<td><strong>Thesis A</strong></td>
<td><strong>Thesis B</strong></td>
</tr>
</tbody>
</table>

The University of Sydney
Budget

Total Awarded Budget: AUD34,415

- staff support for developing labs / flight testing sequence / drone construction (2016)
- staff support for pilot trial run with selected students (2017)

School of AMME contribution

- hardware for pilot trial
- long term sustainment of project (hardware and staff support)
Developing Interactive Applications to Helping Instructors Integrate and Refine Active Learning

Educational Innovation Grant

Presented by
Alejandro Montoya
School of CBE
Developing Interactive Applications to Helping Instructors Integrate and Refine Active Learning

Alejandro Montoya, T Langrish, A Abbas, F. A Marroquin

School of Chemical and Biomolecular Engineering
School of Civil Engineering
Strategic Teaching Grant 2016
The Issue

Traditional lecture slides are not interactive. Based on a static format. Slow to adapt to complex examples.

Example: Lecture slides of thermodynamic course in CBE.
The AIM
Enhance lecture presentations of fundamental engineering aspects using automated approaches for active participation of students. The central aims are:

a) Deploy and validate the effectiveness of an interactive e-teaching approach
b) Design innovative interactive visual materials to expand the domain of current applications to project-based units of study in engineering
c) Determine a timeline of theory-vs-practice for lectures using interactive apps
**APPROACH**

**INTERACTIVE APPLICATION**

**STAGE ONE: DATABASE**

- CREATE
- EDIT
- USE

**Topics**
- Thermodynamics
- Flow of fluids
- Applied Statistics
- Numerical methods
- Unit operations
- Distillation Towers
- Finite element modelling
- Analysis of truss frames
- Plane elasticity bending problems
STAGE ONE: DATABASE
STAGE TWO: IMPLEMENTATION

- Video explaining the interactive application, and providing additional information on the academic aspects of the topic
- Assessment would be marked/unmarked
OUTCOMES

- Increase satisfaction/feedback of students with units of study
- Develop programing skills in Wolfram CDF applications
- Create a Blackboard site with interactive applications for units in the Faculty of Engineering
Funding to support the work of a software developer was requested and approved, $34,000
Promote Programming Literacy with Interactive Media.

Open Learning Environment (OLE) Grant

Presented by
Zhiyong Wang
School of IT
How did it start?

- Interests
- Opportunity
  - SEG-OLE
Promote Programming Literacy

- Innovate programming teaching by integrating digital and physical worlds with interactive media

- Make learning programming more attractive and engaging to every possible student
My Reflections

- Aim & Innovation
  - Why does it matter to a large audience?
  - What is missing?
  - How is different?
- Alignment with Strategic Plan 2016 – 2020: Strategies and Initiatives
  - Transform the undergraduate curriculum
  - Transform the learning experience
- Deliverables
  - Content and schedule (e.g., pilot offering, online, workshop)
- STEM
Developing virtual Fluid Mechanics laboratory to enhance teaching and learning.

Educational Innovation Grant

Presented by
Chengwang Lei
School of Civil Engineering
Issues with lab experiments for CIVL2611 Introductory Fluid Mechanics:

- 350 – 380 students, 5 students per group, 70+ groups
- Scheduled over many weeks
- Attending before relevant content is covered
- Need multiple sets of apparatus – significant costs associated with purchase, maintenance, operation and storage
- Late feedback after lab session
- Heavy marking load

Prior to 2015: No lab in CIVL2611; all labs in CIVL3612

In 2015: One lab in CIVL2611
Project goals

- To develop virtual Fluid Mechanics experiments to complement physical experiments
- To create a game-like environment and an interactive platform to engage students
- To improve learning experience and enhance learning outcome through mix real and virtual labs
- To facilitate automatic marking and feedback
Unity3D
https://unity3d.com/

- A cross-platform game engine
- Content-rich
- Interactive
- Cost-effective
1. Physical Scene Development
   • Create physical scenario with relevant objects such as water jet and floating ball etc.

2. Algorithm Embedding
   • Encode theoretical or empirical correlations into the virtual laboratory system

3. Data Validation
   • Validate collected data by comparison with theory and/or experiment

A Ball Suspended by a Jet Flow
## Project budget

<table>
<thead>
<tr>
<th>Expenditure</th>
<th>2016</th>
<th>2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software &amp; accessories</td>
<td>$4.6k</td>
<td></td>
</tr>
<tr>
<td>Personnel – Casual Programmer</td>
<td>$12.2k</td>
<td>$12.2k</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$29.0k</strong></td>
<td></td>
</tr>
</tbody>
</table>
Integrated Online Modules for a Blended Experience.

Educational Innovation Grant

Presented by
Ehssan Sakhaee
School of Civil Engineering
Teaching Approach

The teaching philosophy and approach is based on three elements:

1. Psychological Elements — maximising an autonomy-supportive environment for students, ensuring the tasks match the skill level of students at various levels and various knowledge backgrounds as well as positive communication with students.

2. Sustainability and Scalability: the design of the website ensures it is scalable and sustainable for small and large numbers of students through the way students interact with each other (explained in the next section).

3. Design Elements — design elements support the other two elements (1 and 2) through a simple intuitive interface.

4. Testing student engagement in formative (in oppose to summative) activities and videos.
Activity Map: Concept/Topic (sub-module)

Online Activity (individual work)

Do Pre-Activity (Case Study) and Respond

Chunk (Content)

Do Post-Activity (formative assessment)

Comparison & Self-Reflection (formative or summative)

Engage through Online Discussion Forum

Face-to-Face (Lecture) and Online

Share Summary of results and experiences

Briefing (Theory)

Group Activity

Group Reflection And Summary

Final Anonymous Individual/Independent Feedback on Topic and individual activities using the Critical Incident Questionnaire

Discussion forum moderated by tutor

Replicated Online Via Web Conference (Synchronous & Async) Collaborate Ultra

Engage through Online Discussion Forum

The University of Sydney
Sub-module 1 of Module 1

Pre-activity (test/survey/quiz)

Module 1

Unlock

Learning Chunk 1

Post-activity (Discussion Forum)

Sub-module 2 of Module 1

Modules

Module 2

Unlock
Version A:
Tightly integrated activities and videos (TIVA) using Articulate Storyline 2

Version B:
Loosely coupled videos and activities (LOCVA) Created using native Blackboard functions
Evaluation of Model

Data analytics drawn from the LMS will be used to analyse student engagement online in both purely online and blended students (PMGT5872 Weekly and PMGT5872 Online). The strategy is to have an tightly integrated version of activity and learning chunk and activity and a loosely coupled activity and chunk to investigate level of engagement in the two versions. The hypothesis is that the tightly coupled version would result in a higher student engagement as the experience would feel like one whole activity to the student, whereas the loosely coupled version would require the student to view the experience as separate activities. This would justify the use of a third party software such as Articulate Storyline 2 to develop the tightly coupled activity-chunk version.

Student feedback is also used to gather information about the learning experience of the module. Additionally we will use the new USS item that enables to assess the effect of the innovation on the learning experience of the students.

Social Network Analysis will also be used to identify level of interactivity of students in the discussion forums.
Conclusion

Thank you for attending