New Undergraduate Model for broadly based Spatial Science Curriculum at Queensland University of Technology: Diversity in Surveying Curriculum

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Presented by Robert Webb
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A university for the REAL WORLD

The XXIV FIG International Congress 2010: Facing the Challenges - Building the Capacity - Sydney, Australia.
Introduction
New Undergraduate Model for broadly based Spatial Science Curriculum at Queensland University of Technology: Diversity in Surveying Curriculum

- Brief history survey & mapping courses @ QIT/QUT
- Major Faculty/Courses Re-structure in 2006
- Broad-based Undergraduate model applied
- Curriculum Mapping approach adopted & applied to the Spatial Science program at QUT.

- What does the current course look like now?
- Exploring Course Quality
- WIL- improving "graduate employability"
- Higher Education Reform in AU(snapshot)
- Conclusions

Some History of Survey & Mapping Programs

Timeline of Surveying and Mapping Courses at Q.I.T./Q.U.T.

FIG Congress 2010
Facing the Challenges – Building the Capacity
Sydney, Australia, 11-16 April 2010
Some overarching principles of the Desired BEE Undergraduate Model

- Crother and Savage (2008) describe this coming together of these Faculty goals, and ideas of transformative learning.  
  More info in the paper 4161

- These new courses would provide the student with opportunities:
  - for self construction and divergence
  - for integrated trans-disciplinary study
  - to learning through and in practice (workplace learning)
  - Opportunities to engage in discovery (research) and application (external and community service) activities through a thematic approach to faculty activities. (Crother and Savage 2008)
Desired Model of the Shared Course Structure BEE

Where does Surveying/ Spatial Science fit within BEE?

- **Bachelor of Engineering** with majors in: Aerospace Avionic, Civil, Civil and Environmental, Civil and Construction, Computer Systems, Electrical, Informechnronics, Mechanical, Medical, and Telecommunication, with scope in the future for Chemical Engineering, Process Engineering, Building Services Engineering
- **Bachelor of Urban Development** with majors in: Construction Management, Property Economics, Quantity Surveying, **Spatial Science**, and Urban & Regional Planning.
What is Curriculum Mapping?

• Central element of curriculum mapping is an exercise involving staff review of
  – learning outcomes, content, learning activities, and assessment of a given course
  – identify where and how graduate attributes are taught, practised, and assessed within the whole course.

• This exercise shows that many graduate attributes are already being developed but not in an explicit way.

• The Curriculum Mapping process can reveal opportunities for new or improved alignment between aspects of course design.

What is Curriculum Mapping?

• Most common approaches to developing graduate attributes in Australia and internationally is curriculum integration or embedding.

• Involves facilitating students' development of graduate capabilities within disciplinary contexts of the courses they undertake as part of their undergraduate university programs.

• Informed by framework to guide and steer the effective development of practice and scholarship surrounding teaching and learning at QUT.
QUT Teaching Capabilities Framework

- Four dimensions to this framework

1. Engaging Learners
2. Designing for Learning
3. Assessing for Learning
4. Managing for Learning

Graduate attributes inform the wider community about the qualities, skills, knowledge and abilities developed by the University's graduates.

The Curriculum Mapping Process adopted for Review of Spatial Science @ QUT

- Influenced / informed by following:

  1. University of Qld – Teaching & Learning Support
     - mapping and embedding graduate attributes approach
  2. University of NSW - Learning and Teaching
     - curriculum mapping approach
  3. Consideration of own QUT teaching and learning frameworks with supportive graduate capabilities resources.
Curriculum Mapping Process @ Spatial Science QUT
Hybrid Model – 4 Sequential Segments

1: Program mapping - What do the learning outcomes and graduate capabilities mean when applied to graduates of the Spatial Science unit/program?

2 Course mapping - How does each of the units within a program support the development of discipline specific graduate attributes? Several thematic layers applied to fundamental course map matrix to determine strengths/weakness.
C.M. Process @ Spatial Science QUT
Hybrid Model – 4 Sequential Segments

• **3: Program review** - How does the whole program contribute towards the expected graduate capabilities? *Faculty/ University level.*

• **4: Evaluation and revision** - How can discipline themes and individual learning units be refined to ensure developmental and sequential support for students to develop program graduate attributes? *5-7 year cycle*

• **MORE DETAILS IN THE PAPER**

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Photogrammetric Mapping: Strength over time?

- However, a continuing strength between these two surveying and mapping courses (comparing 2005 with 2008) has been the teaching alignment of photogrammetric mapping principles, practice and applications.

- The preliminary *curriculum mapping process* has shown a consistency in delivery and outcomes through this photogrammetric unit.
S.A.M.S. Basic Course Map

An Enhanced Thematic Representation

2008 Course Matrix: UQ40 Bachelor of Urban Development (Spatial Science)
Themes of **Spatial Science @ QUT** include

1. **Measurement Science/ Surveying Centric Theme**
   sequential learning units with rigid pre-requisites – supported by science minor

2. **Land Development Theme** with strong cadastral surveying “flavor”. Recognition received from Surveyors Board of Qld when mapped against the Qld Surveyors Board Competency Frameworks (2007)

3. **Mapping Science/ GIS Centric Theme** has contracted to an identified six units (20%). However, this theme has seen student growth from outside disciplines.

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**Spatial Science Minor** offered to other programs
Student choice of 4 units

- Geospatial Positioning and GPS
- Geographic Information Systems
- Remote Sensing
- Geospatial Mapping
- Spatial and Land Information Management
- Spatial Analysis Practice
Bachelor of Urban Development (Spatial Science)

Exploring Course Quality

How do the students rate the learning experience?

Learning Experience Questionnaire - every subject, every semester
✓ 5 questions on teaching
✓ 5 questions on unit
✓ Open questions/comments

University Management have started to use results as performance measures.

Course Map Matrix – Spatial Science

**Course Map 2009: UD40 Bachelor of Urban Development (Spatial Science)**

<table>
<thead>
<tr>
<th>SPATIAL SCIENCE UD40S8</th>
<th>Year 1</th>
<th>Year 2</th>
<th>Year 3</th>
<th>Year 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semester 1</td>
<td>Semester 2</td>
<td>Semester 1</td>
<td>Semester 2</td>
<td>Semester 1</td>
</tr>
<tr>
<td>Spatial CORE UNITS (18 units)</td>
<td>UOS101</td>
<td>UOS102</td>
<td>UOS103</td>
<td>UOS104</td>
</tr>
<tr>
<td></td>
<td>Surveying</td>
<td>Surveying</td>
<td>Engineering Surveying</td>
<td>Control &amp; Surveying &amp; Analysis</td>
</tr>
<tr>
<td>SCIENCE Minor (6 units)</td>
<td>MSE151</td>
<td>MSE152</td>
<td>MSE153</td>
<td>MSE154</td>
</tr>
<tr>
<td></td>
<td>Scientific Computing</td>
<td>Statistics</td>
<td>Calculus</td>
<td>Linear Algebra</td>
</tr>
<tr>
<td>School Focused Units (6 units)</td>
<td>MSE156</td>
<td>MSE157</td>
<td>MSE158</td>
<td>MSE159</td>
</tr>
<tr>
<td></td>
<td>Urban Environment</td>
<td>Environmental Economics</td>
<td>Environmental Economics</td>
<td>Environmental Economics</td>
</tr>
<tr>
<td>Integrated Transdisciplinary Units (4 units)</td>
<td>MSE150</td>
<td>MSE151</td>
<td>MSE152</td>
<td>MSE153</td>
</tr>
<tr>
<td></td>
<td>Information Technology</td>
<td>Information Technology</td>
<td>Information Technology</td>
<td>Information Technology</td>
</tr>
<tr>
<td></td>
<td>1 = Faculty wide unit</td>
<td>2 = School based common unit</td>
<td>3 = SCIENCE Minor unit</td>
<td>4 = Applications Minor unit</td>
</tr>
</tbody>
</table>
**2009: LEX Unit05 Question**

> I have been satisfied with the overall quality of this unit.

**Scale 0.0 to 5.0**

<table>
<thead>
<tr>
<th>Spatial Core Units (18 units)</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UO0011 Integrating Computing</td>
<td>3.9</td>
<td>4.6</td>
<td>3.5</td>
<td>4.2</td>
<td>2.8</td>
<td>3.4</td>
<td>4.5</td>
<td>4.1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Science Minor (4 units)</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UO0201 Scientific Writing</td>
<td>3.3</td>
<td>3.3</td>
<td>3.7</td>
<td>3.7</td>
<td>4.1</td>
<td>3.2</td>
<td>4.2</td>
<td>4.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>School Based Units (5 units)</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UO0202 Integrating Computing</td>
<td>3.0</td>
<td>4.4</td>
<td>3.6</td>
<td>3.2</td>
<td>3.2</td>
<td>4.3</td>
<td>3.2</td>
<td>3.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Interdisciplinary Units (4 units)</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
<th>Semester 1</th>
<th>Semester 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>UO0101 Integrating Computing</td>
<td>2.9</td>
<td>4.1</td>
<td>3.3</td>
<td>3.0</td>
<td>3.7</td>
<td>3.1</td>
<td>3.9</td>
<td>3.7</td>
</tr>
</tbody>
</table>

1 = Freshmen unit; 2 = School based common unit; 3 = Science Minor unit; 4 = Applications Minor unit; 5 = Spatial Science Core unit

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**2009 Contours of LEXU05 Quality Question over Course Matrix**

Visualization by Robert Webb
Spatial Science at QUT – LEXu05 Terrain Quality 2009

Other Urban Development Disciplines
LEXu05 Terrain-Quality Presentation Trials
Work Integrated Learning (WIL) Environments

Work Integrated Learning (WIL)

- WIL described as a form of practical education that integrates periods of academic study with periods of work experience in jobs related to the students study area.

- Increasing pressure on Australian Universities to give greater emphasis and accept more responsibility for “graduate employability”.

- Two instruments used nationally measure and report graduates success in gaining employment.
  - Graduate Destination Survey (GDS)
  - Course Experience Questionnaire (CEQ)
Partnerships:

- Distinctive feature of effective work-placement programmes (such as occurs in nursing programs) is that they involve partnerships among diverse groups:—
  - Employers
  - Students
  - Academic teachers
  - Higher education managers
  - And professional bodies

Summary of W.I.L. Teaching

- The teaching and learning content in WIL unit(s) predominantly will be delivered in the workplace, under the supervision of practicing professional.

- Duration of the WIL directed employment will vary as required by the specified Course/Major(study area).
  
  - For Spatial Science, this is a minimum of 14 days over a 15 week period.
  - These WIL days ALSO contribute towards the 90 days industrial experience requirement.
Higher Education Reform in AU

A very dynamic context

Review of Australian Higher Education

BUDGET 2009-10

Transforming Australia's Higher Education System

A NATIONAL QUALITY AND STANDARDS AGENCY
HIGHER EDUCATION PERFORMANCE FUNDING
GOVERNMENT PROGRAM SUPPORT FOR TEACHING AND RESEARCH
MISSION-BASED COMPACTS FOR UNIVERSITIES

Higher Education Reform in AU

Standards & public accountability

TEQSA

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Higher Education Reform in AU  *(A Snapshot)*

- New funding mechanisms for **Research**
  - Sustainable Research Excellence (SRE)
- Intention of AU government to expand educational opportunities
  - Target of increasing the number of 25-34 year olds holding a bachelor level qualification to **40 percent by 2025**.
  - Increasing targets in low **Socio-Economic Students**

Conclusions

**New Undergraduate Model for broadly based Spatial Science Curriculum at Queensland University of Technology: Diversity in Surveying Curriculum Paper 4161**

- The role of **curriculum mapping** in whole-of-course design has been shown to be a useful process to academic and unit content advisors.

- Restructure of the Spatial Science program generally aligns to the university corporate-orientated business models to focus on **high volume, low overhead** programs and provide for future capacity.
Conclusions
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✓ Work Integrated Learning is viewed as contributing industry relevance and depth to a students learning experience.

✓ New undergraduate model applied to courses will ensure graduates of the Faculty of Built Environment and Engineering leave QUT with:
  – a broader understanding of professions,
  – broader understanding of disciplines and workplaces,
  – combined with recognisable professional competence.
Questions?

Where have we been located at Gardens Point?

- School of Surveying (1976-1987)
- School of Planning, Landscape Architecture and Surveying (PLAS) (1988-1999)
- School of PLAS/DBE (1999-2005)
- School of Urban Development (2006-2009)

Where have we been located at Gardens Point?