How Education is Shaping the Modern Surveyor/Geomatic Engineer

Garfield YOUNG, Roger MURPHY, and Martin SMITH

The University of Nottingham, UK

Presentation structure

- Introduction
- Research aims and strategy
- Survey education structures
- A solution?
- Teaching/learning methods
- Conclusions
Introduction

• There is some discussion about the role of the land surveyor in the modern context particularly the impact of technology

• Term 'geomatics'
  - Is it a name change?
  - Does it signal a paradigm shift in
    • Structure
    • Content
    • Delivery
    • Philosophy of education programmes

• Can the educational strategies used in traditional land surveying provide the competencies required for the geomatics engineer/modern surveyor?

The Research Aims

• To explore differences in the design and delivery of curricula and the pedagogical approaches used in surveying/geomatics programmes.

• To consider how differences in curricula and pedagogy used in surveying education relate the issue of students’ preparedness for work in the surveying profession.
The Research Strategy

- Sixteen university-based curricula for broad comparative analysis and three distinctly different programmes for case study research.
- Data obtained through:
  - interviews with academic staff, students and professional surveyors;
  - observation of teaching and learning sessions;
  - review of documents prepared by the universities for students of the surveying programme
- Generated significant amount of data so this is feedback on the early analysis

Surveying Curriculum

- University based curricula in countries on 4 continents are included in the study
- Most countries believe it still has a strong foundation in mathematics and physics
- Influence of technology is evident (variable) in all curricula
- Little consensus regarding content and structure of surveying curricula
- Influenced by where the course resides in the institution
  - In civil engineering; a strong engineering focus
  - In forestry, planning, geography; a strong environmental focus
Surveying Curriculum

- Some similarities
  - Inclusion of core modules in key surveying areas such as plane surveying, engineering surveying and geodesy.
  - Practical components that work in tandem with theory and/or done on practicum exercises (off campus residential field courses)
  - Aware of the need to change content, content focus, teaching methods, instrumentation etc as the technology changes.
  - Influenced by professional bodies and market demands.
  - The desire to obtain accreditation from recognized bodies influences content, equipment, staff arrangements, delivery methods, assessment strategies.
  - Constraints imposed by institutional guidelines.

Contemporary Factors Impacting Surveying Education
Bachelor’s vs. Master’s

An issue of standards for the industry?

- Most countries require a BSc for professional qualification.
- Few require more than an undergraduate degree.
- Variation in what is considered BSc.
  - 3 or 4 year BSc
  - Variation in matriculation
  - Diverse standards?
- Higher degree offer more opportunities to build higher level skills and competencies
  - Critical thinking skills
  - Management skills
  - Capacity of innovation
- Need for some level of agreement on Body of Knowledge and Standards.

Traditional vs. Modern

Catering to a new breed of students?

- Most universities’ curricula have strong traditional features with modern aspects
- How relevant are the curriculum designs to the modern world (student characteristics, technological changes, professional demands?)
Vocational vs. Academic

Is the University influencing industry or vice versa?

- Role of Universities in question
- Strong ‘vocational’ emphasis in surveying/geomatics
- ‘Geomatics’ perceived to be improving the scholastic image
- Need for labour market planning to make clear the different levels of workers required in the field

Technical vs. Managerial

Is the focus changing?

- Character of measurement process has changed but function still important.
- Incorporation of increased management of spatial information and planning in many countries.
- Some curricula do not reflect this change.
- Need to find a way to incorporate both the technical and the managerial.
- It should be reflected both in the curricula and the pedagogical approaches employed.
A Solution?

Moving from ...

Curriculum architecture

- There are clear variations in the structure of surveying curricula
- The structure and content of surveying curricula are influenced by a number of factors including but not limited to:
  - The faculty/department with which they are associated
  - The local surveying industry
  - The expertise of its academic staff
  - The university culture and policies
  - Student interests
Pedagogy

- Is about the relationship between four key elements of education:
  - teachers
  - learners
  - learning tasks
  - learning environment

- Variations observed:
  - Traditional with modern flavour - the formal structure is primarily based on lectures supported by other methods with no or very little evidence of innovations.
  - Traditional alongside modern - lecture-based approach used alongside other methods with some innovations.
  - Modern with traditional flavour - mostly modern approaches with many innovations but traditional lecture-based approaches still evident.
  - Significantly modernised - largely innovative with an obvious moving away from the traditional approaches (eg student centred, life long learning)

Range of pedagogical applications used in surveying programmes

<table>
<thead>
<tr>
<th>Pedagogical Approaches</th>
<th>Educational Cultures</th>
<th>Traditional</th>
<th>Traditional with modern flavour</th>
<th>Traditional alongside modern</th>
<th>Modern with traditional flavour</th>
<th>Modern</th>
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</thead>
<tbody>
<tr>
<td>Lectures</td>
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<td>Tutorials</td>
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<td>Practical exercises</td>
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<td>Field courses</td>
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<td>Worked-based</td>
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<td>Seminars</td>
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<tr>
<td>Project-based/Project-organised</td>
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<tr>
<td>Problem-based</td>
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Linking pedagogical approaches with expected learning outcomes

<table>
<thead>
<tr>
<th>Skills type</th>
<th>Learning objectives / Industry competencies</th>
<th>Recommended pedagogical approaches</th>
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</thead>
<tbody>
<tr>
<td>Discipline specific</td>
<td>Theoretical principles in surveying and related spatial sciences</td>
<td>Technology aided lectures, group work, printed and internet resources</td>
</tr>
<tr>
<td>Discipline specific</td>
<td>Theoretical application of principles</td>
<td>Tutorials, group work, lectures, printed, internet resources &amp; PBL</td>
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<tr>
<td>Discipline specific</td>
<td>Computational skills</td>
<td>Tutorials, group work &amp; field courses</td>
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<tr>
<td>Discipline specific</td>
<td>Drawing and designing skills</td>
<td>Supervised labs, group work &amp; industry attachment</td>
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<tr>
<td>Discipline specific</td>
<td>Practical skills using equipment in executing surveying and related tasks</td>
<td>Field exercises, field courses, industry attachment, group work, PBL &amp; project-based learning</td>
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<tr>
<td>Discipline specific</td>
<td>Professional ethics</td>
<td>Guest lectures (professionals) &amp; industry attachment</td>
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<tr>
<td>Generic &amp; discipline specific</td>
<td>Team work</td>
<td>Group work, project work, industry attachment, field courses, seminars</td>
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<td>Generic &amp; discipline specific</td>
<td>Management of resources</td>
<td>Lectures, industry attachment, seminars, group work &amp; PBL</td>
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<tr>
<td>Generic</td>
<td>Communication skills</td>
<td>Seminars, oral presentation &amp; PBL</td>
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<td>Generic</td>
<td>Inter disciplinary skills</td>
<td>Seminars &amp; industry attachment</td>
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<td>Generic</td>
<td>Problem solving</td>
<td>Problem-based learning</td>
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<td>Generic</td>
<td>Analytical skills / Critical thinking</td>
<td>Problem-based learning, PBL research, seminar, industry attachment</td>
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<td>Analytical skills / Critical thinking</td>
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<tr>
<td>Generic</td>
<td>Life-long learning skills</td>
<td>Self-directing activities such as PBL, group work, research, self assessment etc.</td>
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Conclusion

- It is understandable that there have been and will remain differences in curriculum structures and content due to variations in the role of the surveyor in different contexts.

- Universities are encouraged to critically analyze their existing educational structure to ensure that there is a clear link between curriculum goals and the pedagogical approaches employed.

- Universities should not just continue with approaches based on inertia.
Thank you

Contact details

Dr Martin J Smith
IESSG, The University of Nottingham
Innovation Park, Nottingham NG7 2TU, UK
Telephone: +44 (0) 115 951 3885
Email: martin.smith@nottingham.ac.uk