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# How Education is Shaping the Modern Surveyor/ Geomatic Engineer

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## Presentation structure



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



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## 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?



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## 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.



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## The Research Strategy



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- 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



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## Surveying Curriculum



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- 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



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## Surveying Curriculum



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- 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**.

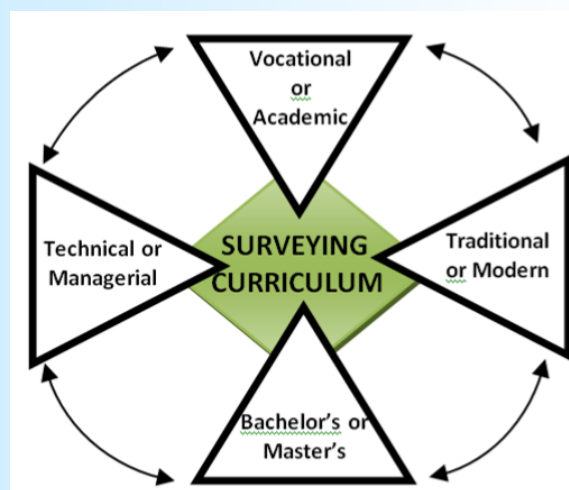


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## Contemporary Factors Impacting Surveying Education



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## Bachelor's vs. Master's



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### 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.

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## Traditional vs. Modern



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### 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?)

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## Vocational vs. Academic



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### 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



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## Technical vs. Managerial



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### 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.



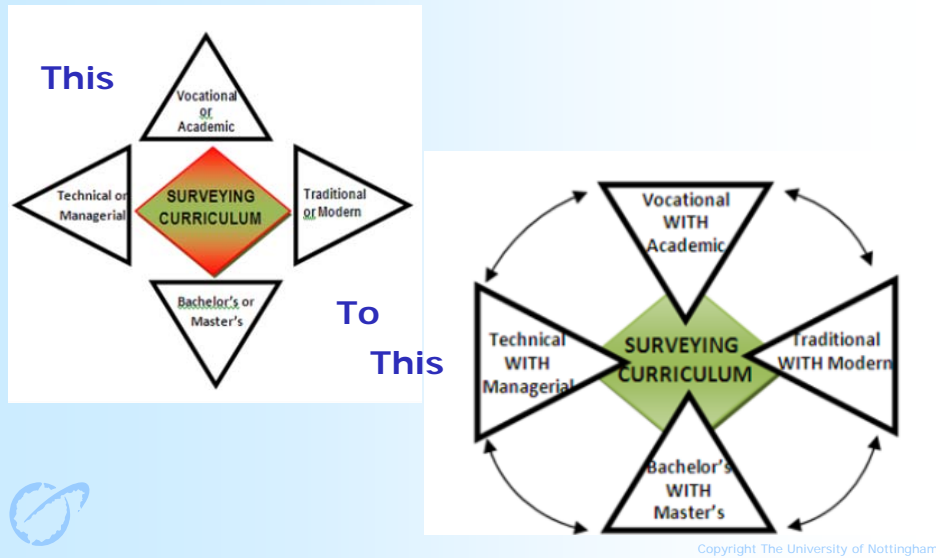
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## A Solution?



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Moving from ...



## Curriculum architecture



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- 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



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# 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)



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# Range of pedagogical applications used in surveying programmes



Pedagogical Approaches ↓	Educational Cultures →	Traditional	Traditional with modern flavour	Traditional alongside modern	Modern with traditional flavour	Modern
Lectures		[Bar spanning all categories]				
Tutorials		[Bar spanning all categories]				
Practical exercises		[Bar spanning all categories]				
Field courses		[Bar spanning all categories]				
Worked-based			[Bar spanning from Traditional with modern flavour to Modern]			
Seminars				[Bar spanning from Traditional alongside modern to Modern]		
Project-based/Project-organised			[Bar spanning from Traditional with modern flavour to Modern]			
Problem-based				[Bar spanning from Traditional alongside modern to Modern]		



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## Linking pedagogical approaches with expected learning outcomes



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

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## Conclusion



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- 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.

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**Thank you**



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