Action Research for a New E-Learning GPS/Surveying Platform

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Outline

✓ The Project
  – Team, Background, Focus Programs and Courses
✓ Geospatial Education at RMIT
  – Framework, Challenges, Opportunities
✓ An e-Learning Platform
  – Mind Map, Wiki Online Platform, Multimedia Tools
✓ A Case Study
  – Methodology, Outcome
✓ Conclusions
✓ Demo
Project Team

✓ Geospatial Academics
- Prof Kefei Zhang
- Dr Gang-Jun Liu
- Rod Deakin
- Dr David Mitchell
- Bill Cameron
- Lucas Holden
- Dr David Silcock
- Dr Hai Xu
- A/Prof Chris Bellman

✓ Researchers
- Erjiang Fu
- Ming Zhu
- Yanxi Zhou
- Suqin Wu
- Sue Choy
- Bobby Wong

✓ SEH Managers/Consultants
- Stuart Whitman
- Hans Tilstra
- Meg Colasante

Project Background

To produce work ready graduates who are better equipped with knowledge and skills and able to assist government and business to solve critical practical problems and face global challenges.
Focus Programs and Courses

- Surveying 4
- Geodesy
- Surveying 3
- Geospatial Science Major Project
- Survey Network Design and Analysis
- Grad Dip and Masters in Geospatial Information
- Geospatial Information by Research

- Advanced Diploma of Spatial Information Services
- Spatial data requirements
- Data Collection and Validation
- Capture new data
- Validate existing data
- Collate and interpret data
- Monitor spatial components
- Creation of new spatial data
- Design project deliverables
- Research and development

Geospatial Education at RMIT- A Framework

- Teaching & Learning
- Learning Experience & Outcome
- Assessment & Feedback
- Industrial Solution & Practicum
Geospatial Education - Challenges

- Unsatisfied industrial solutions and productivities
- Poor learning experience and outcomes

Geospatial Education - Opportunities

- Flexible environment
- Efficient learning
- Personalized pathway

- Multimedia capability
- Advanced assessment
- Targeted feedback

- Multimedia capability
- Extended platform
- Contextualized scenarios

WEB & IT
- Wiki
- 3/4D
- Flash
- Blogs
- Forums
- Simulation
- Podcasting
- Blackboard
Geospatial Science and Technology

e.g. Rapid developments of GNSS

- From the first satellite launched in 1978 to today’s reliable cm-level positioning world wide
- Many new GNSS systems under development
  - e.g. European GALILEO, Chinese Compass/Beidou, Japanese QZSS and Indian systems
- Wide applications
  - space objects tracking, precision farming, sports, recreational and intelligent transportation
- 260,000,000 search results in Google for GPS/GNSS

With such rapid developments of the GNSS technology and applications, how Geospatial Education at RMIT can meet the rapidly evolving needs of both the geospatial industry and the learner community?

Industry Requirements

The geospatial industry needs

- to be kept abreast of the latest developments in the “enabling” geospatial technologies, including GNSS
- a platform for engaging (and interacting) with university academics for vocational and professional development, and R&I activities
- an authority and standardised knowledge base for
  - the sustainable developments of the industry, including
  - e.g. surveyors’ on-going training
Experience and Outcome

Students’ perspective

✓ The multi-dimensional and dynamic nature of GPS and surveying components
  - e.g. rotation, various coordinate systems, datum, timeframes, map projections and satellite signal propagation
  - cause difficulty for students to grasp if represented two-dimensionally (e.g. on a standard whiteboard)
✓ Mega online information is often
  - less structured
  - repeated
  - “uncensored”
  - misleading
✓ Lead to poor learning experience and outcome

Teaching and Learning

Lecturers’ perspective

✓ How to employ digital multimedia and WEB techniques
  - to help students better understand multidimensional and dynamic geospatial concepts
  - to inform students the latest developments in GNSS technologies and applications in a timely and effective manner
  - to enhance our knowledge delivery to different levels/groups of students
  - to design, align and integrate tasks and assessment
  - to inform and influence students’ learning attitude, process and approach
  - to prepare students as effective and responsible geospatial professional practitioners
✓ ……
Assessment and Feedback

Traditional assessment and feedback in Geospatial Science are:
- more content-focused than student-centred
- limited by two-dimensional media (paper-based)
- hard to identify individual’s strength and weakness

How to overcome these limitations by deploying e-learning platforms:
- are open, distributed, dynamic, interactive, and responsive
- have flexibility (to meet varied learners’ needs and interests) and scalability (i.e., the more users the better)
- provide global, 24/7, and flexible access to contents, resources, tasks and scenarios
- engage students in active learning, higher order thinking and problem solving
- less flexible (e.g., one-size-fit-all in terms of contents, context, scope, time and place)
- hard to identify individual’s strength and weakness

Advantages of e-Learning Platforms

- Flexibility
- Efficiency
- Effectiveness
- Learner-centred
- Enable lifelong learning by overcoming the barriers between our social, educational and professional lives
An e-Learning Platform

Main Components

✓ using customized mind map
  – as a learning tool for structuring, categorizing and navigating a large amount of information
  – to guide students with various backgrounds and/or needs
✓ employing a wiki online platform for collaborating and communicating
  – among teachers, students and teachers/students
  – across HE and TAFE at RMIT
  – with external contributors/participants
✓ using multimedia tools to
  – develop and present relevant animations and simulations
  – support student-centered and problem-based authentic learning, assessment and feedback
FIG Congress 2010
Facing the Challenges – Building the Capacity
Sydney, Australia, 11-16 April 2010
Multimedia Tools

Problem-based Assessment and Feedback

Our approaches

✓ To work with colleagues, students, industry and government agencies
✓ To identify a range of geospatial industry-focused situations and contexts for the applications
✓ To design a bank of simulations and cases (i.e. problem-based learning questions / tasks / activities) based on industry and professional practitioners’ inputs
✓ To develop and implement these cases by using web and multimedia technologies
✓ To incorporate these cases into formative and authentic assessment processes
A Case Study
e-Learning Platform for GPS Positioning

- Select “GPS satellite orbit determination” as a key component of GPS courses
- Choose appropriate types of multimedia
- Develop a set of 3/4D animations
- Collect student feedbacks

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**Concepts**

- GPS system
- Satellite orbit
- GPS positioning

**Data: RINEX**

- Other files
  - Satellite description
- Navigation file
  - Format
  - Description of parameters
- Observation file
  - Format
  - Description of parameters

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**Texts**

- Interactive Animations
- Photos and videos

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**GNSS Constellations**

Using the arrows on the keyboard to change the view.
Conclusions

✓ The advantages of e-learning platforms have been recognized widely and more and more such platforms are playing critical roles in higher / professional education, e.g.
  – To improve the representation of multidimensional, dynamic, and complex scientific concepts and real world cases for learning and assessment
  – To overcome the limitations in using static 2D media for more effective and efficient representation of dynamic 3D geospatial concepts, processes, and real world situations / scenarios
✓ Inputs from geospatial industries and students need to be considered and integrated into the learning, assessment and feedback processes

http://emedia.rmit.edu.au/satellite/