Case Methods, Pedagogical Innovation and Semantic Technologies

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Ensemble Project

- Semantic Technologies for the Enhancement of Case Based Learning
- Exploring the potential of semantic technologies to support and enhance teaching and learning in a variety of settings in higher education: specifically advanced undergraduate courses at the University of Cambridge and postgraduate and professional courses at City University, London

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Project Context

- 3 Year ESRC-EPSRC project (2008-2011)
- TLRP Technology-Enhanced Learning Phase
- Characteristics:
  - Multi-institutional
  - Interdisciplinary
  - Must address quality criteria and contribute to understanding in both ESRC and EPSRC 'constituencies'
  - Research and development, not just 'implementation'
- Addresses 'moving targets' - both technological and pedagogical - and may contribute to this 'movement'

http://www.ensemble.ac.uk

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Educational Semantic Web

- A space ‘open to be filled with meaning’ (Allert 2004)
- In a teaching and learning environment in which the potential of semantic web technologies had been fully realised, teacher and learner engagement would be fluid, flexible and generative (Koper 2004)

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Teaching and learning with cases

- The use of cases has spread quite widely into areas previously outside the classical case-based-learning areas of management, medicine and law
- The landscape of methods using cases is thus varied, with different learning goals and underlying theories and models, and with some roles of cases shared across ‘families’ of practices, as well as some very distinctive uses of cases

The role of cases

- Core of commitments to:
  - learner autonomy
  - engagement with authentic data
  - representation of ‘reality’ (engagement with authentic data, ‘real world problems’, simulation or role-play)
- Differentiated enactments of:
  - adaptation to domains
  - tensions in institutional goals (e.g. vocational vs. academic), education levels, teacher (e.g. where, for example the teacher is also an active researcher)
  - student identities
  - curricular environment (e.g. CBL accompanied by lectures rather than as the sole method)

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Practices to support

- Students actively developing understanding, and identifying learning issues and misconceptions.
- Small-group discussions are very common in CBL because they mirror the workings of practitioners when they are faced with real-world problematic situations
- Cases represent a problem space where exploration can be guided by, for example, constraining the access to information or by promoting a more description-oriented search of resources

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Alignment

- The work of the project is focused on settings in which complexity, contestation or rapid change makes some kind of case based learning the pedagogy of choice.
- Semantic technologies appear to offer an architecture that aligns well with current educational tenets of active, problem- and case-based, and collaborative and distributed learning that respond to changing realities in educational provision as well as workplace demands.

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Research Questions

- What are the nature, scope and role of cases and case based learning across disciplines in higher education and their relationship to learning outcomes and expertise?
- How do teachers and learners design, develop, describe and reconstruct cases, and how do these processes contribute to academic and professional outcomes?
- What are the pedagogical affordances of using semantic web technologies in support of case based learning?
- What new tools can be developed to allow users (teachers, researchers) to access, adapt and manage their case based learning and that of others?
- What are the theoretical framings for researching technology enhanced learning and informing interdisciplinary dialogues when knowledge, technologies and pedagogies are in a state of flux?

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Participatory Research Approach

- Includes teachers and learners in the co-interpretation of evidence associated with practices
- Involve participants in the identification of the relationships between educational dimensions of case-based learning and features of semantic technologies
- Exploring with participants how specific technological affordances align, intersect or conflict with existing and emergent practice

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Research Methods

- Because of the diverse nature of the settings that we have studied we have developed and adapted our methods accordingly
- A commitment to series of interviews, multimodal data collection of naturalistic settings (document analysis, observation of classroom practices) and focused co-interpretation activities is characteristic

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Settings

- Maritime Operations and Management
  - MSc case-based modules
  - Teams of students are given time to solve conceptual problems and make management response plans based on authentic data
- Plant Sciences
  - 3rd yr undergraduate case-based module on Algal Biofuels
  - Students work in small groups to evaluate the potential of Algal Biofuels to contribute to energy production
- Archaeology
  - 2nd yr undergraduate ceramics practicals
  - Students are introduced to ceramics in archaeology

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Cases in MOAM

- **Cases are reports of problematic situations as they were lived by the teacher**
- **Students engage with cases as a group, independent of lecturer facilitation**

- **Cases as representations of reality**
  - "I rely on cases to get across what is in the industry, the whole combined areas"

- **Cases as the basis for teaching what it means to be a practitioner**
  - "A practitioner is somebody who can run an operation or company and complying with legislation, keeping the balance sheet right and know who (which expert) to ask"
  - "A practitioner does not need in-depth knowledge, like an expert, but he needs broad knowledge and he needs to know how to put the jigsaw together"

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Cases in Plant Sciences

- **Collaborative engagement with cases supported by mentors and consultants**
- **Developing understanding and explanations in small-group discussions**
- **Cases as the basis for teaching what it means to be a practitioner**
  - "you're trying to get them to think about and `What is it that I would do as a biologist in order to solve the problem of biofuel production from algae?"
- **Cases for developing expertise**
  - "The benefit for them is actually going to be that they are going to be experts, not just in their one little field, but in all… potentially in all the three areas that we're concerned with."
- **Bounded cases**
  - "I mean we have to give them quite specific guidelines about what you should be aiming to address in building your case…we have to constrain this to some extent, otherwise it could be expansive and you'd never know when you'd finished."

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Cases in Archaeology

- **Teacher directed engagement with cases**
- **Using an object as a case to demonstrate a 'way of seeing'**
- "Its not something like a fixed body of knowledge that we want them to know but its a way of seeing more than anything else and its a way of sort of looking at material and sort of understanding what are the important aspects why are certain things archeologically interesting and why are they not?"
- "I have usually used that thing of trying to basically teach those basic things of holding a pot up and trying to think about what's the shape we are thinking about here and which way do you think the rim might have been oriented…so you can show certain things and you offer that perception."
- **Anecdotes as cases?**
- "I think for the students the anecdotal information doesn't necessarily give them direct you know a direct experience well it does in a way but it kind of prepares them for a state of mind of being open to gaining real kind of tactile skills in the field or being able to cope with quite complex situations whether it is in the field or even analytically."

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Teaching and learning environment, (location & students)	Character of case knowledge	Characteristic teaching and learning activities involving cases	Current use of learning technologies in T and L environment	Use of technologies in current professional practice	Potential areas for semantic technology development
Marine Operations (City PG)	Experience-based "lessons", "stories" and "challenges"; requiring practical reasoning across domains	Illustrative cases with a lesson; broader scenarios with design task; unguided, no facilitated engagement	Low, generic applications	High, specific applications	Meaning-driven access to authentic data; guiding open-ended processes through selective access to resources.
Plant Sciences (Cam UG)	Changing knowledge base from a lecturer to a student focus; includes real-world complications; evolves along with academic research publications	Semi-structured problems within broader scenario involving collaborative building of a case	Moderate, generic applications such as a VLE and online literature searches	High, specific applications	Mediated access to resources that retains links to original data. Support for collaborative analysis.
Archaeology (Cam UG/PG)	Complex knowledge; socialisation; interdisciplinary; evolves alongside academic research practices	Emergent cases drawing on acdemic research practice, with more structured activities 'embedded'	Moderate, specific applications	Moderate, specific applications such as databases and statistical analysis software	Integration of authentic data integration, including expert accounts of research practices

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Conclusion

- The provision of access and retrieval of resources (esp. authentic data) guided by consistent ontologies and taxonomies, the ease of combination and re-combination of these, and the much improved interoperability that results, have promise in supporting learning in rapidly changing domains where dealing with complexity is seen as indicative for expertise.

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Technology Enhanced Learning

Teaching and Learning Research Programme

Award Holder

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