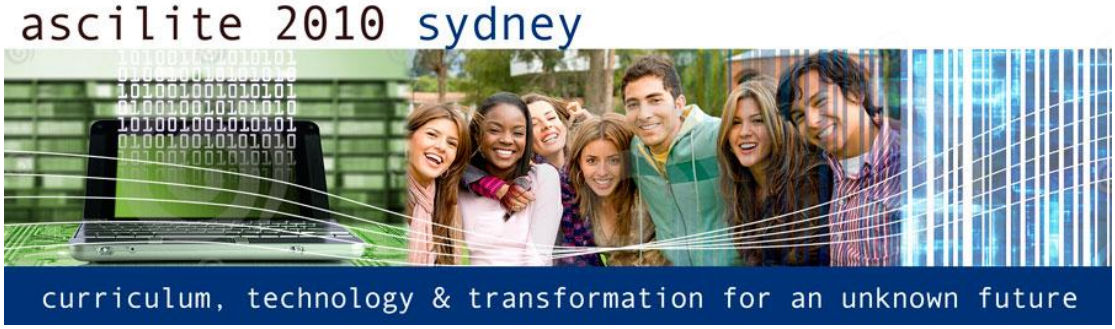

Do online activities inspire students in the science disciplines? Engaging students in learning science with online activities: Affordances and limitations

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This symposium will draw together the work of several authors and practitioners who have investigated various approaches to engaging students in the sciences with online learning activities and e-assessment tasks. Participants will engage in debate and discussion on the affordances of the online environment, the nature of science education and what evidence we have that the online environment is appropriate and effective in engaging all students in learning in the sciences.

Keywords: science education, online learning, e-assessment

Introduction

This symposium will be aimed at teachers in the science disciplines and educational developers working with teachers in science. The symposium will offer participants an opportunity to hear about specific examples of the use of the online environment to engage science students and discuss and debate some of the issues around different learning styles and capabilities of science students, whether all students are engaged with online activities and how teachers might make most effective use of currently available resources.

This symposium will draw together the work of several authors and practitioners who have investigated

a range of approaches to engaging students in the sciences with online learning and assessment activities. The presenters will draw predominantly from their own works and briefly present an aspect on how the online environment has been used to engage science students with learning activities and assessment tasks. The presentations will provide a catalyst for debate and discussion on the nature of science education, the different learning and assessment styles of science students and the affordances of the online environment to cater for students with different abilities and interests.

The presenters will use the work of Boud (2007), Knight (2007), Nicol (2009) and Mantz (2005) to frame the learning and assessment environment required in universities. Several sub-themes will be presented and debated during the symposium, including the question of whether online resources motivate all science students, the apparent disconnect between online learning activities and assessment tasks, and the effectiveness of particular multimedia applications to science education.

The presenters will engage the participants with specific examples from their own work to illustrate the principles of engagement and interactivity and why this is crucial to learning in the sciences. The symposium will be presented from the perspective of a critical analysis of the affordances of the online environment, the nature of education in the science disciplines and what evidence we have that the online environment is appropriate and effective in engaging all students in learning in the sciences.

Case study 1: Geoffrey Crisp

Traditional science assessment tasks have relied on students having restricted access to online environments and limited access to tools and resources during the assessment process. This has necessarily limited the type of task that can be completed by the student. By allowing students to have access to a variety of digital tools during an assessment task, teachers are able to set more complex and demanding tasks and students are able to demonstrate a wider variety of skill development. We will describe some examples of digital tools that can be used by students individually or in groups, to complete more sophisticated tasks. These examples will foster a discussion on the nature of assessment in science disciplines and lead to a debate about the ability of teachers to set appropriate assessment tasks for students.

Case study 2: Kristine Elliott

Education in bioscience disciplines has a number of broad goals, including the development of scientific inquiry capabilities (Elliott *et al*, 2009; Elliott *et al*, 2010). This presentation will introduce a learning design to enhance conceptual understanding of the scientific inquiry process. It will describe how the learning design was used as a 'blueprint' to create an online learning environment for second year biochemistry students, and their engagement with it. The discussion will then broaden to a national context by drawing on some of the major findings from an ALTC funded project, which examined 26 cases from Australian universities where bioscience educators were intentionally teaching scientific inquiry skills. The roles that educational technologies play in supporting development of skills will be discussed, along with educators' views about the nature of scientific inquiry and why technology is not always integrated into teaching. This data will provide fertile ground for debate about the affordances and limitations of online activities to engage students in bioscience education.

Case study 3: Garry Hoban

Using accessible technology (digital still camera, free movie making software and everyday materials) and asking students to design explanatory resources for their peers is one way to engage students in learning science. A "Slowmation" (abbreviated from Slow Animation) is a stop-motion animation created by students that is played slowly at 2 frames/second to explain a science concept. It is a simplified way of making digital animations that promotes creativity and a deep approach to learning because students are designing an animated resource to explain a science concept to their peers. He will provide examples and articulate the theoretical framework which explains why this approach is engaging and leads to quality learning. Free examples and instructions can be seen at www.slowmation.com.

Case study 4: Michael Nott

A potential weakness of fully on-line courses is the lack of a face-to-face learning opportunity as afforded in traditional well-structured on-campus tutorial sessions. Our premise is that correctly structured video tutorials will allow students taking a fully on-line course to enjoy the advantages of face-to-face delivery. Evidence to date suggests that this may generally be the case, but there is a lack of empirical research, particularly in the context of tertiary science. In our research we hypothesised that video tutorials (delivered using ElluminateLive®) are as effective as traditional face-to-face tutorials in enhancing engagement, promoting learning, and developing oral presentation capabilities. Our results, informed by the literature, will underlie a discussion on the value of video tutorials in fostering student engagement and capabilities. Additional data, from academics and industry experts who participated in the tutorials, will encourage debate on "whether, given the effort, it is all worthwhile?

Case study 5: Will Rifkin

Can science undergraduates be motivated by activities that have them express science content in 'new media' - blogs, audio and video podcasts, wikis and social networking — the popular communications forms that increasingly impact on their lives? This case study outlines different approaches to developing science students' content knowledge and graduate attributes via science communication, specifically through the use of different tools for publication on the web. The aim is to exploit a growing number of online publication opportunities to enhance not only the learning that can be gained from a video production process, for example, but also the motivation to select science and to engage effectively in its study at university.

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Presenter contact details and biographies:

Geoffrey Crisp, author of the e-Assessment Handbook, and the HERDSA Guide on e-Assessment, will describe approaches to interactive e-assessments for science students. He will present arguments around the misalignment between many of the current learning activities that students undertake in the online environment and the subsequent assessment tasks they are asked to complete in their courses.
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Kristine Elliott is an educational technology developer and researcher, specialising in the creation of educational technology programs for the biomedical sciences and health science professions. She will present the argument that educational technologies play an important role in supporting development of scientific inquiry skills in bioscience students, and subsequently why we need innovative pedagogies in undergraduate bioscience education.
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Garry Hoban is an Associate Professor in the Faculty of Education at the University of Wollongong. He is the creator of "Slowmation" (abbreviated from "Slow Animation") which is a new way for students to learn science by making their own stop-motion animations to explain a science concept (Hoban, 2007; Hoban, 2009). He currently holds an ARC Discovery Grant and an ALTC Competitive Grant in this area.
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Michael Nott teaches Pharmaceutical Sciences at RMIT University. He develops on-line strategies with the aim to enhance student engagement and capability development and, with his colleagues Phillip Poronnik and Diana Donohue, is currently comparing the effectiveness of on-line tutorials with face-to-face sessions.
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Will Rifkin is Director of the Science Communication Program in the Faculty of Science at the University of New South Wales. He is both an engineer and sociologist with degrees from MIT, University of California-Berkeley, and Stanford University. He was affiliated with the Institute for Research on Learning in Silicon Valley in the 1990s and later helped to launch the Program on Social and Organizational Learning at George Mason University. In the past decade, he has been recognised as one of Australia's most effective university instructors. His focus in research and consultancy is communication among experts and relative non-experts in settings ranging from steel mills and public hearings to doctors' offices and classrooms. He currently serves as a team leader for a project funded by the Australian Learning and Teaching Council to develop assignments that have university science students creating videos, podcasts, blogs, and wikis in place of traditional reports and presentations.
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