# Motivate students by having them publish in new media: An invitation to science lecturers to share and test

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***Abstract:*** *Can science undergraduates be motivated by activities that have them express science content in 'new media' – the popular communication forms that increasingly impact on their lives? In this paper, we are describing rationale, approaches to date, and a new project designed to develop the content knowledge and graduate attributes of science students via science communication. Specifically, the project is designed to foster student publication on the web – a medium of learning and publication that students find engaging, staff increasingly see as practical, and employers value as relevant. The aim is to enable science lecturers to exploit a growing number of publication opportunities provided by the web 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. The web also offers ready opportunities for cross-university and international collaboration. This paper serves as a prospectus, an invitation -- based on our research and experimentation -- for science lecturers to participate in the project.*

## A project to identify, develop, engage

This paper outlines and provides rationale for a project to engage and motivate science students in simultaneous development of their content knowledge and graduate attributes via science communication, specifically through student publication on the web. The project described draws on a decade of classroom experimentation by the authors as well as accepted knowledge in higher education about the effectiveness of well-designed authentic learning and the recognised importance of participatory design in enticing people to try to new approaches.

Here, we are seeking to have science lecturers experiment with having their students create new media, something that requires the involvement of people like you, our readers. Hence, this paper serves not only as a description but also as an invitation to share with us your innovative 'new media' approaches and to trial approaches that we assemble. Your participation will help us to find out how broad and how significant the impact of such 'new media' science communication strategies can be on teaching and learning of university science.

New media for the web can be seen as an appropriate 'hook' to capture the attention of both university students and, some would argue, their lecturers. Not only is it of increasing relevance professionally but production processes engage students in authentic tasks and work-integrated learning, strategies that have demonstrated their effectiveness in development of graduate attributes.

The project described here is beginning to identify, develop, and disseminate teaching strategies and resources suited to large classes in science, based on a suite of teaching approaches already employed by project team members. The aim is to disseminate amongst science lecturers teaching strategies that have students creating 'new media,' such as podcasts, blogs, webzines, and web sites.

This strategy for providing graduate attributes for science students has demonstrated its effectiveness in terms of student motivation and learning outcomes over the past decade in the

classes of project team members, e.g., student-created 'Day in Science' web sites at UNSW, which provide career guidance for high school students (Rifkin, 2004; Rifkin, 2007; www.adayinscience.net) and science videos produced by students at the University of Otago that are reaping a high volume of visits on *iTunesUniversity*. Effectiveness is evident not only in the publications created but also in the insights revealed consistently and extensively in reflective essays completed by the students involved, in informal feedback, in formal feedback, and in communications from graduates. These 'returns' compelled development of this project.

The project specifically draws on expertise in science communication because the field addresses key graduate attributes -- written and oral skills, teamwork, ethics, and critical thinking. Our aim is to assist science lecturers who need to teach about a rapidly expanding base of scientific knowledge and methodologies while responding to pressures from a range of stakeholders to develop students' graduate attributes.

These students, while increasingly familiar – and engaged – with camera phones, *FaceBook*, *Wikipedia*, *YouTube*, and other 'new media' capabilities, are not entirely expert with them. Even recent experience across the authors' universities suggests that a majority of students lack both technical ability and the capacity to compose professionally effective messages with these media. Even less adept with new media technology would be many of their lecturers (Kennedy, Dalgarno, Bennett, Judd, Gray, & Change, 2008). That may explain why, even though interest is growing among lecturers in assigning their students to participate in online publishing (e.g., *Day in Science*), uptake has been slow.

Learning through online publication by science students has not been investigated thoroughly nor widely integrated into teaching (Tatalovic, 2008). This situation suggests a need for analysis, adaptation, and what has been called '2nd generation innovation' (Southwell, Gannaway, Orrell, Chalmers & Abraham, 2005). This process can occur when potential adopters of teaching approaches are engaged in their re-design, with this early engagement becoming a first step in dissemination. Such an approach has been called an 'engaged dissemination strategy' in that it uses a participatory design methodology, a methodology that is widely employed in the software and computer industries (spurred by such work as Winograd & Flores, 1987).

Hence, this project aims to have lecturers in science and in science communication collaborate in development of teaching materials for web publication by students in mainstream science subjects. A community of practice (Lave & Wenger, 1991) can be built to address what each group recognises as common concerns, such as development of student employability and more accurate portrayal of science in public (Jasanof, 1998; Wellcome Trust, 2000). An outcome would be increased exploitation of publication opportunities provided by the web in order to enhance the motivation and engagement of students in developing their graduate attributes in science via authentic learning designed around new media production processes. Toward this end, this paper serves as an invitation to science lecturers in Australia from their colleagues in science communication.

## Needs, expertise, and opportunity

### Science and communication

It is universally accepted that our graduates should have good skills in oral and written communication. Almost every job advertised has, among its essential selection criteria, the need for 'communication skills.' The *Employability Skills for the Future* report (DEST, 2002) cited communication skills as being critical. Yet, studies have identified a lack of communication skills and related abilities, especially in science graduates (Australian Council of Deans of Science, 2001), which has caused the Australian Council of Deans of Science (ACDS) to recommend development of

'new approaches to the teaching and learning of generic skills' (ACDS, 2008, *unpublished expression of interest*). Representatives of industry employers have reported an overall lack of confidence in graduate abilities, particularly with respect to "generic skills" gained through a Bachelor of Science (Raison, 2006). To quote one study: "Many enterprises reflect[ed] that they no longer wanted technical 'boffins' or operators who could not communicate with their work to peers or clients"(DEST, 2002).

Given this recognised need, our project relies on expertise in science communication and the academic field's relationship with science. Science communication is a relatively young academic area that addresses informal science education, public relations and journalism, and science-in-society as well as science content (Mulder, Longnecker & Davis, 2008). Science communication academics educate students to publicly communicate about research and the implications of that research. Students also learn to facilitate debate about how to address current issues involving science, such as climate change and genetically modified foods.

Tertiary-based science communication programs are increasingly taking a leading role in developing the graduate attributes (GA) of science students. For example, hundreds of students are being taught in core GA subjects in science degree programs at Monash University and the University of New South Wales. New Zealand's Ministry of Science and Technology is currently considering whether science communication should become an obligatory part of all science degrees, echoing a recommendation at the University of Western Australia (Hutton & Pluske, 2005). This sentiment is not peculiar to the Asia-Pacific, as a UNESCO report (2003) recommends: "… Science communication training [should be] part of a scientist's education."

Numbers of full-time, affiliated, and casual staff in science communication have been growing since 2000 along with student numbers. The field's rise has been spurred by rapid scientific development in contested areas of the life sciences, such as genetic engineering, realisation of threats, such as climate change, and efforts to build interest in science among school students via outreach and enrichment programs run by science communicators. In this same period, there has been increased interest in graduate attributes across Australian universities, with evidence indicating that this responsibility is falling to science communication academics at a number of universities. Science communication can thus be seen to represent an area of increasing need and interest within science faculties.

Full-time science communication academics involved in the project described here bring key areas of expertise and experience to the creation of the learning materials needed to enable science lecturers to guide students in creating multi-media for online publication. These areas reflect the capabilities of science communication academics internationally in including media and communication insight, knowledge in scientific disciplines, and a portfolio of educational methods (Mulder, Longnecker & Davis, 2008). Based on this expertise, the project's core team members have each been developing over the past decade exercises for their students to create 'new media' publications.

**Publication opportunities for students**

Until recently, student participation and responsibility for the content and organization of student publications has been an extra-curricular enterprise participated in by a self-nominated few (the law review and student newspaper being time-honoured traditions). The web now allows for cost-effective publication, which in turn enables student publication to become a mass learning activity, one that can be integrated into coursework. Many more students can now learn how to understand and cater for target audiences as well as discovering the advantages of employing video, audio, images, social networking, and hyperlinked text to enhance their communication. However, while today's students may be 'web orientated', they are not as web capable as popular belief suggests

according to findings of the "Net Generation" project funded by the Australian Learning and Teaching Council (ALTC) (Kennedy, Dalgarno, Gray, Judd, Waycott, Bennett, Maton, Krause, Bishop, Chang, & Churchwood, 2007). These results echo experiences of project team members.

Despite such challenges, when students in our classes have engaged in such publication, their reflective essays reveal that their effort and assessment have become 'authentic.' Their submissions indicate that a vast majority of students recognize the relevance to professional work of their tight deadlines, need to maintain open channels of communication with teammates, and provision of constructive feedback so that the output of their collective efforts appeals to their intended audience. With a few exceptions, they exhibit an engagement and enthusiasm that indicates appreciation that their output is available to a real viewing public, a public whom scientists must increasingly seek to engage (Davies, 2008; Dumlao & Duke, 2003; Trench, 2008).

**Relevant research and development**

Teaching through student web publication builds on a range of initiatives for addressing the challenging task of enhancing the capacity of academic staff and enriching the curriculum in science, particularly in relation to graduate attributes (The Carrick Institute, 2007). This research addresses both lecturer and student perspectives.

The Carrick Institute, now the ALTC, explained their initial grant-giving focus on improving science teaching by stating that science lecturers had proved to be particularly refractory to efforts to change teaching practices attempted by those running projects by Carrick's predecessor, the Committee for University Teaching and Staff Development (*Ibid*.). One can conclude that prior experimentation in science teaching indicates that new approaches will not be taken up readily. Diffusion strategies need to attend to aspects of the culture and context of university science teaching that would be familiar to you, readers -- a heavy focus on covering content, a predominance of didactic teaching, a concern about accountability fueled by a rise in managerialism in Australian universities, increasing workloads for academic staff, continual changes in university ICT systems, and an aversion to time-consuming marking, particularly of students' writing. This array of concerns underlines the need for lecturer engagement in our development processes, so that teaching materials created can provide appropriate learning of content, genuinely reduce workloads, etc.

For students, the report of the ALTC-funded 'Net Generation' project, already mentioned, recommends 'appropriately structured and scaffolded access to emerging technologies at university' and 'designing learning activities that model sophisticated 'real-life' uses of emerging technologies as they are applied in the professional and scholarly communities' (Kennedy et al., 2008). This project is addressing both of these aims by building on the experience of core team members in developing and employing such learning activities in their own classes. The project will also reflect caveats raised by studies of the impact of information and communication technologies (ICTs) in university classrooms, (e.g., Gosper, Green, McNeill, Phillips, Preston, & Woo 2008), particularly the realisation that introduction of new technology does not, in and of itself, result in more effective learning.

Crebert, Bates, Bell, Patrick, and Cragnolini (2004) present initial evidence supporting the contention that authentic learning tasks, particularly forms of 'work-integrated learning', are effective in developing students' graduate attributes. This evidence is consistent with assessment of submissions, including reflective essays, over the past decade by project team members, where we have employed work-integrated learning in having student publication projects that require teamwork among students acting in different roles and working to tight deadlines.

## Teaching approaches, sites, community

### Materials

We are producing project and assessment guidelines, teaching strategies/lesson plans, student guides, case studies, and workshops to guide university academics in integrating student web publication and accompanying development of graduate attributes into their teaching. Teaching and learning materials are being developed for student projects that produce new media publications in four areas: (1) podcasts, (2) videos, (3) blogs, and (4) mixed media websites. A set of four teaching or assessment strategies per new media area is an initial target, pending input from our intended user community. These materials are being identified or created as well as developed, workshopped, and tested. The workshop and testing protocol for materials in each of the four areas will involve up to ten early adopters -- academics who already address graduate attributes in their teaching of science students and who agree to employ resources from this project in their teaching, at least on trial basis.

### Web Platform

The effort is making available a free venue for educationally effective, web publication of material created by science students offering multi-university and international collaboration for students and staff. This project's new media platform is being developed to allow student publication about science by uploads of videos, podcasts, profiles, webzines, and blogs. The project team have secured URLs for these web platforms – www.studentscience.net and www.scienceyarns.com. The two sites serve different purposes, the former with content specifically for the community of undergraduate science students, and the latter containing content designed for the wider community.

The online platform accommodates publication of mixed media: text, images, audio, video with links to existing online forums – *iTunes University*, *World-Wide Day in Science*, *The Triple Helix* student science magazine/journal, and *YouTube* (university-based *YouTube* 'channels'). Capacity for online peer review before publication is being incorporated. Assessment via *Calibrated Peer Review*® (*CPR*), for example, is already used by over 650 universities for more traditional assignments. It lightens the marking load of academics (as we have found), which provides an incentive for uptake of this project's materials. The peer review process on *CPR* has demonstrated in our experience that it can improve students' critical thinking, as well as their composition abilities. That is evident in the quality of student writing and argumentation as well as in students' reflective essays and in ongoing and end-of-session feedback.

For the purposes of peer review, the online publishing platform necessarily has a layer (www.studentscience.net) with access restricted to university students, which enables ready publication of all work irrespective of quality. That layer can have sections reserved for a particular class or opened for all of the site's users. Peer review can address factors such as the suitability of content and presentation strategies for the intended audience and message. As student work clears peer review and is edited and improved, the work can then be moved to the other layer, a public site (www.scienceyarns.com) where an unrestricted audience can be reached and its reactions gauged.

### Community of Practice

A key outcome intended for this project is growth of an international network/community of practice of new media science academics and students who engage with the methods and outcomes we address. The project's workshops at conferences and universities, along with follow-up by the project team, are conceived to build connections among academic staff interested in new media publication by their students (a dissemination strategy recommended by McKenzie, Alexander, Harper & Anderson, 2005).

A kernel of this community of practice is already evident in the project's core team, early adopters

recruited to date, and members of an Australian and international network of science communication academics (ENSCOT Team, 2003; Turney, 1994). The international network, Public Communication of Science and Technology (PCST), includes, for example, the Science Communication Observatory at Pompeu Fabra University in Barcelona, who run the largest science communication program in the Spanish-speaking world. They have been participating in UNSW's *Day in Science* web publication process for six years. Imperial College London hosts the largest program in the English-speaking world, and they are eager to explore collaborative publication opportunities. Similarly, staff from ten universities in Australia, members of the Science Communication Education and Research Network, have contributed to the planning of this project.

An invitation for readers and their colleagues to join this community of practice is, as stated, the purpose of this paper. Such a community – involving lecturers in both science and science communication – offers the possibility for attuning our students' graduate attributes to the digital age. Additionally, one can imagine the attractions of 'new media' publication activities, which can engage and thus motivate students not only to address science but to address the corresponding graduate attributes, which will benefit the science arena generally.

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