Collaboration, Contextualisation and Communication Using New Media: Introducing Podcasting into an Undergraduate Chemistry Class

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Abstract

This paper describes the introduction of a podcasting task into an undergraduate chemistry unit. By foregrounding student collaboration, contextualisation of content, and the use of new media, it was designed to promote a deep approach to the learning of content, as well as enhancing science communication skills, and generally improving motivation.

Students from this large (n=352) chemistry class worked in groups of three to create a podcast explaining an assigned topic, before evaluating classmates' podcasts. Many groups displayed considerable skill and creativity in communicating their messages. Student feedback was collected via an anonymous survey, using both Likert scale questions and open questions, and via comments on discussion threads in the university learning management system.

Student comments indicate that most considered this assignment a positive and motivating experience. We suggest that some deep learning occurred, based on students' perceptions of the podcasting task. Students also developed and practised teamwork and science communication skills, both important graduate attributes. They completed the assignment with minimal need for technical tuition on the part of the unit coordinator or demonstrators. While further research is necessary to determine the effect on learning of content, these results demonstrate the feasibility and efficacy of the use of similar assignments in large, introductory science classes.

Introduction

Teaching students from a range of non-chemistry majors such as biomedical science, engineering and geology constitutes a significant proportion of the first year undergraduate teaching load for chemistry departments around Australia. These classes are often challenging to teach as many students have a low level of interest and motivation, with the majority only enrolling because chemistry is required for their chosen degree. Additional challenges to instructors are posed because the enrolment in these classes is often high, yet the interests and backgrounds of the cohorts vary greatly; hence teaching the subject material in a context suitable for all of the students is difficult (Lawrie, Matthews, & Gahan, 2010).

This paper details the development and implementation of a group podcasting assignment in an undergraduate chemistry unit. This task gave students an opportunity to explore a chemical concept in depth and/or to explore different applications of that concept relevant to their chosen discipline(s) and degree(s). Placing emphasis on student collaboration, contextualisation of content, and the use of new media, it was designed to promote a deep approach to the learning of content, as well as enhancing science communication skills, and generally improving motivation. This study demonstrates the feasibility and efficacy of the use of similar assignments in large, introductory science classes.

Collaboration, contextualisation and communication

Setting collaborative learning tasks provides an opportunity for students to break into smaller groups and complete activities that require them to relate introductory chemistry concepts to the context of their chosen degree. A well-designed task can involve students in working together to make sense of key concepts, relating these concepts to their pre-existing knowledge across a variety of disciplines, and communicating their understanding to others. This can in turn help steer students away from a surface approach to learning, which is typically extrinsically motivated and focuses on passive reproduction of isolated facts and information, and towards a deep approach, which involves active understanding of meaning (Biggs & Tang, 2007; Ramsden, 2003). Deep approaches typically correlate with higher-quality learning outcomes and higher grades (Biggs, 1990; IAUL, n.d.; Ramsden, 2003) and, specifically, greater retention of learning over time (Ramsden, 2003). It has been widely observed that deep approaches also correlate with greater student satisfaction and enjoyment (Biggs & Tang, 2007; Ramsden, 2003), which is of considerable importance in non-major units where student motivation may be low.

In addition, small group-based activities provide a means for the development of communication skills, which are recognised as an important graduate attribute irrespective of discipline (Crebert, Bates, Bell, Patrick, & Cragnolini, 2004). More specifically, the ability of science graduates to communicate effectively is vital to their employment prospects, to their contribution to society, and to society's reception of science (Australian Council of Deans of Science, 2001; DEST, 2002; Jasanoff, 1998; Wellcome Trust/MORI, 2000). Yet employers have noted that it is unfortunately common for science majors to graduate with underdeveloped communication skills (Australian Council of Deans of Science, 2001; Raison, 2006).

Despite the potential for promoting deeper understanding of content at the same time as developing graduate attributes, limited literature exists on the use of small group-based activities in chemistry curriculum at a tertiary level (Yeung, Read, & Schmid, 2006). Huddle (2000), Mills, William, Demeo, Marino, & Clarkson (2000) and Wimpfheimer (2004) describe collaborative learning tasks where students are required to work in small groups to prepare scientific posters on a given chemistry topic, which they then present to their peers. Other published studies give examples of alternative small group-based activities involving extensive writing tasks to promote effective communication and critical thinking in chemistry (Oliver-Hoyo, 2003; Van Ryswyk, 2005; Whelan & Zare, 2003).

New media

New media, enabled by digital technologies, are beginning to play a key role in education. Many of these new media have emerged as part of the shift from web 1.0, the informational web, to web 2.0, the social web, which involves the active production rather than simply the passive reception of media. Used appropriately as a platform to facilitate multimodal collaboration between students, new media can support learner-centred pedagogical approaches where students learn through active engagement with content and with peers (Pegrum, 2009a; 2009b). This can in turn promote deep learning.

New media also have increasing relevance professionally and engage university students in authentic tasks and work-integrated learning (Rifkin, Longnecker, Leach, & Davis, 2010). It might be argued that while facility with new media is an essential attribute of all today's graduates, it is particularly central for science communication. However, many undergraduate programs do not currently specifically incorporate tasks involving new media. The present study is in fact a spin-off of an Australian Learning and Teaching Council (ALTC) grant entitled: 'New media to develop graduate attributes of science students' (Rifkin et al., 2010). Aims of the grant include identifying and developing teaching strategies and resources suited to large classes in science, such as the creation by students of new media products like podcasts. This reflects recognition of the potential of new media to enhance science communication.

Given that many students are already keen users of digital technologies, which are often well integrated into their everyday lives (Cluett, Pegrum, & Skene, 2011), the use of new media in education can be very motivating. At the same time, while students may be adept at using new technologies for social and entertainment purposes, they may not always know how to use them appropriately for educational purposes (Cluett, 2010; Pegrum, 2009b) or indeed professional purposes such as, in this case, an explanation of important scientific concepts. Incorporating new media techniques such as podcasting into a program of science study therefore allows educators to capitalise on students' pre-existing enthusiasm for digital technologies, as well as guiding them in the appropriate educational and professional applications of those technologies.

Podcasting

Podcasts are an increasingly popular educational tool, as demonstrated by a proliferation of dedicated podcasting guides for educators at different levels (e.g., Braun, 2007; Fontichiaro, 2008; King & Gura, 2007; Williams, 2007), alongside more general new technology guides containing sections on podcasting (e.g., Bradley, 2007; Green, Brown, & Robinson, 2008; Richardson, 2010). A podcast is a digital audio recording, typically produced using a digital voice recorder, a smartphone, or a laptop or desktop computer, and uploaded to a specified online location such as a learning management system (LMS) like WebCT or a platform like iTunes. Audio software like Audacity or GarageBand can be used to edit the podcast before uploading, though this is not always necessary. In the strictest definition, a podcast is a series of syndicated audio files attached to an RSS feed, but in the current paper the term is used, as is increasingly common nowadays, to simply mean any audio file, whether syndicated or not. The requisite hardware is cheap and portable, the software easy to use, and online storage (and syndication) straightforward (see e.g., Shamburg, 2009, 2010).

The emerging research literature on podcasting shows that the term is frequently used to refer to what is sometimes known, particularly in higher education, as *coursecasting,* where audio recordings of lectures or tutorials are made available to students. McGarr (2009) refers to this as *substitutional* podcasting. A variation on this idea, referred to by McGarr as *supplementary* podcasting, consists of teacher-produced podcasts on key topics, which students can listen to on a needs basis. Advantages of these kinds of podcasts may include learner choice and flexibility; the incorporation of student voices in a discussion format (through students' questions and comments being integrated into recordings); and an alternative way of learning by listening (Rothwell, 2008). Numerous studies find evidence of increased student satisfaction through the use of podcasting, but evidence of improved student learning is more limited (Heilesen, 2010;

Hew, 2009; Vogt, Schaffner, & Ribar 2010). Other studies remind us that for a variety of reasons not all students like using podcasts (Kazlauskas & Robinson, in press).

However, teacher-led approaches like the majority of those covered in the above studies do not fully exploit the potential of web 2.0 tools to involve students in the active production of knowledge, which requires the students themselves to create podcasts. This is referred to by McGarr (2009) as *creative* podcasting and offers numerous potential benefits:

> The student is required to have a deep level of knowledge of the subject matter if they are to successfully construct a suitable podcast, and therefore this type of uses [sic] challenges the student to critically examine the material they have been exposed to previously. This type of use can also develop students' ICT skills through the creation and manipulation of digital media. When provided as a group task, other important social skills, such as the student's ability to collaborate and participate effectively in a group, can be developed. Use of this student generated content can also facilitate peer learning and contribute to a supportive and constructive class environment (p. 317).

Cane and Cashmore (2008) agree that: "student-developed podcasts can be a useful learning tool both for developing subject-specific understanding and in developing a wide variety of transferable skills", and they go on to list a number of key benefits: broadening of knowledge; enhancement of teamwork; greater skills with new technologies; and motivation. These are the kinds of benefits of creative, student-led podcasting investigated in our study.

Background

The podcasting task reported here was set for students enrolled in *CHEM 1105: Introductory Chemistry*, an undergraduate unit offered at The University of Western Australia (UWA). The unit is designed for students with little or no relevant background who need to gain an understanding of basic chemistry. In 2010 it was coordinated by the first author of this paper, and was based on the Western Australian Tertiary Entrance Examination course, with the entire content of the then Year 11 Chemistry syllabus being taught in one 13-week semester. The large amount of material to be covered in such a unit entails a rigid lecture schedule and means it is difficult to deviate from the content during class contact hours.

CHEM 1105 is taught across two campuses, the local Crawley campus (metropolitan Perth) and the Albany campus (approximately 400 km south of Perth). The unit had a total enrolment of 352 in 2010, with eight students enrolled at the Albany campus and the remaining students enrolled at the Crawley campus. Students in this unit are enrolled in degrees across all faculties at UWA, although most are associated with the Faculty of Life and Physical Sciences, the Faculty of Natural and Agricultural Sciences, and the Faculty of Engineering, Computing and Mathematics. The proportion of *CHEM 1105* student enrolments by Faculty in 2010 is shown in Figure 1.

If students achieve above 80% in *CHEM 1105,* they are eligible to enrol in subsequent units for chemistry majors. However, less than 5% of the cohort would generally opt to do this. Approximately 25% of the students go on to complete *CHEM 1106: Biological Organic Chemistry* in semester two, which has a heavy biological focus. Thus, for the majority of the enrolled students, *CHEM 1105* is the only chemistry unit they will complete during their undergraduate studies. In order to motivate and engage these students it is essential they should be exposed to the multidisciplinary applications of chemistry, including the relevance of chemistry to their various home disciplines.

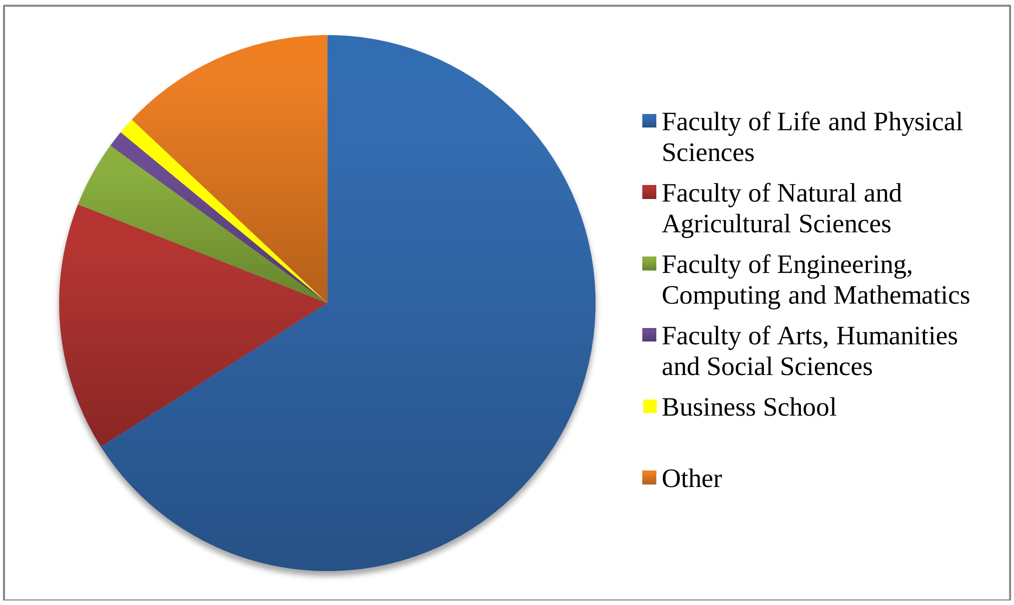


Figure 1: *CHEM 1105* student enrolments by Faculty in 2010.

Implementation of the podcasting task

The task ran over four weeks, starting after the mid-semester break, and was set for all enrolled students at both campuses. Students were briefed about the project in a lecture – which was also made available to Albany campus students through the Lectopia lecture capture system – and provided with an assignment handout via the unit WebCT module. The handout detailed the task requirements and directed students to websites on how to make podcasts. (An electronic copy of the assignment handout, as well as the marking rubric, is available at http://www.communicatingscience.org/teaching/podcasting.) A sample podcast on the topic of 'atoms & chemical bonds', the first topic taught in the unit, was made available on WebCT as a model. Finally, a dedicated discussion thread was set up so students could communicate with their peers whilst doing the assignment, report any technical problems, and discuss related issues.

Students were placed into groups of three by the unit coordinator based on their assigned benches in the practical laboratory class. Groups of three were chosen to ensure that if one person did not contribute adequately, there was still a team of two able to work collaboratively. Because students in any given group shared a biweekly lab class, this ensured they had common free time to work together on the project in the weeks between lab sessions.

The topics of 'acids & bases' and 'oxidation & reduction' were chosen, partly because they are two of the major unit topics, and partly because past examination performance and anecdotal evidence suggested that students find these topics especially difficult and have common misconceptions about them. For example, students often have trouble understanding the concept of acid strength as a measure of dissociation rather than concentration; and they frequently confuse the relationship between oxidising agents and reducing agents, and oxidation and reduction processes.

Half the groups in each lab class were assigned the topic of ‘acids & bases’ and the other half ‘oxidation & reduction’. Apart from the requirement to focus on their allocated topic, groups were given creative licence with the content of their podcast. It was suggested that they could choose to take one aspect of the topic from the lectures and explain it; develop an analogy to convey key aspects of the topic in their own way; or find an application from their home disciplines and explain how it related to their topic. Podcasts were allowed to be a maximum of three minutes long. In order to preserve anonymity, each group was assigned a name to use when it came time to submit the podcasts by uploading them into *WebCT*. Each podcast was submitted as a .wav or .mp3 file in the relevant lab class folder on the discussion board.

Technical support was requested by only one student who could not find the recording function on his mobile phone. While this suggests that most students felt comfortable with the technology involved, this was not always the case, as discussed below. Apart from organisation, then, the podcasting assignment described in this paper required little input from the unit coordinator or demonstrators and thus could be considered an efficient use of limited teaching resources.

Having been posted on the WebCT discussion board during the final week of semester, the podcasts were available for students to listen to during study week. They were asked to listen to six podcasts (that is, their own and five others). Three of these were on ‘acids & bases’ and three on ‘oxidation & reduction’. Students were requested to assess these podcasts – including their own – according to a pre-established rubric with the following criteria, which were designed to emphasise skills essential to science communication:

1. how well the introduction set the scene;
2. clarity, accuracy and relevance of content;
3. whether the conclusion provided a clear summary of main points;
4. structure and flow of the podcast;
5. technical sound quality (volume and clarity).

Bonus marks could be awarded for creativity. Although completing the peer assessment quiz was voluntary and did not contribute to their final mark, 91% of the students who submitted a podcast completed the quiz. The podcasts were also marked by the unit coordinator. The podcast assignment itself was worth 5% of the total unit marks. The marks given by the unit coordinator will be compared to those given by students with a view to using peer assessment as the sole form of assessment in the future. Overall, students scored highly on this assessment task, with the majority receiving a mark of 3 or above out of 5.

Finally, students completed a teamwork assessment, evaluating individual contributors to their own group assignments. Of 117 groups that submitted a podcast, only four reported that one of the team members had not contributed. At the same time, students were asked to sign a digital publication authorisation form to allow selected podcasts, identified by the unit coordinator and students as being particularly effective, to be published on the web. (These podcasts can be found both on iTunes and at http://www.communicatingscience.org/teaching/podcasting.) A few did not agree to their podcasts being made public in this way. A small number of podcasts were unable to be published as they contained copyrighted material, showing the need to give stricter guidelines about this in the assignment handout for future cohorts.

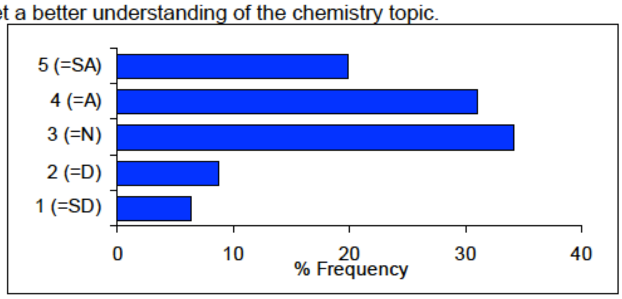
Student feedback

Formal feedback

A written Student Perceptions of Teaching (SPOT) survey, administered anonymously by UWA, was used to collect feedback from students. The SPOT survey is a systematic university survey administered to students at the end of semester to gather feedback on various aspects of teaching and learning in a given unit. The survey for *CHEM 1105* included two Likert scale items (1 = strongly disagree [SD], 5 = strongly agree [SA]), out of a total of 18 items, about the podcasting task. Overall, students gave positive scores for this task, with a mean score of 3.49 for the item 'the podcast activity helped me get a better understanding of the chemistry topic', and only 15% of the students indicating disagreement with this statement. For the item 'the podcast assignment was a good activity', the mean score was 3.31, with only 28% of students indicating disagreement. As previously mentioned, large introductory science classes, such as *CHEM 1105*, can be difficult to teach as the interests and backgrounds of cohorts vary greatly, and in general student motivation in non-major units is low. Students' responses to these items indicate they welcome the opportunity to learn chemistry in a relevant context, and a task such as this, which capitalises on students' pre-existing enthusiasm for digital technologies, is an ideal way of engaging students, promoting deeper learning and improving overall student satisfaction. The frequency distribution of responses for each of the SPOT items is shown in Figure 2.

17. (Item 7597) the podcast activity helped me get a better understanding of the chemistry topic.

Rating	Freq.
1 (=SD)	8
2 (=D)	11
3 (=N)	43
4 (=A)	39
5 (=SA)	25
No response	0
Not applicable	0
Mean	3.49



18. (Item 7598) the podcast assignment was a good activity.

Rating	Freq.
1 (=SD)	13
2 (=D)	18
3 (=N)	37
4 (=A)	28
5 (=SA)	27
No response	3
Not applicable	0
Mean	3.31

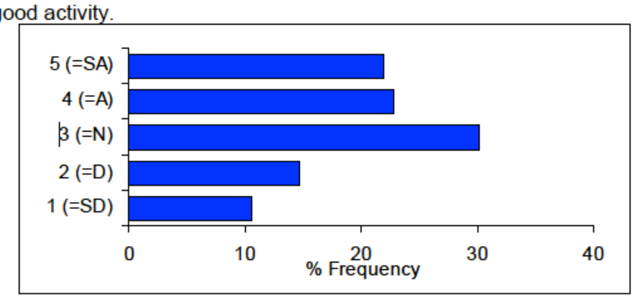


Figure 2: Frequency distributions in Likert scale items for the podcasting task in the anonymous SPOT survey. Students could choose one response from SD= strongly disagree, D= disagree, N= neutral, A= agree, SA= strongly agree. Of the 352 *CHEM 1105* students, 126 (36%) responded to Qu. 17 and 123 (35%) responded to Qu. 18.

The SPOT survey also included two open questions on the advantages and disadvantages of the podcasting assignment. A thematic analysis of student responses is provided in Table 1 (on advantages) and Table 2 (on disadvantages).

Almost half (44%) of the students who provided a comment about advantages specifically mentioned the value of the assignment in promoting deeper understanding of the material, making remarks such as the following:

It made me look at the topic closer [sic] than how I would have otherwise.

The main advantage was the research that was put in – I found I understood the topic more after doing the research and taking the time to understand it.

The podcasting assignment encouraged us to take a more active role in studying our topic and reinforced the main ideas of the topic.

Table 1: Thematic analysis of responses to the SPOT survey question: 'What were the main advantages of the podcasting assignment?' Of the 352 *CHEM 1105* students, 95 (27%) responded. As some comments fitted more than one theme, the total exceeds 95.

Theme	**Total number comments**
Deeper understanding	42
Collaboration	33
Usefulness for revision	16
Motivation	8
Ease of assignment	7
No advantages	6
Acquisition or practice of skills	4
Contextualisation	3
Miscellaneous	5

Table 2: Thematic analysis of responses to the SPOT survey question: 'What were the main disadvantages of the podcasting assignment?' Of the 352 *CHEM 1105* students, 81 (23%) responded. As some comments fitted more than one theme, the total exceeds 81.

Theme	**Total number comments**
Group work	22
Technical issues	19
Brevity of podcasts (max. 3 mins)	17
Time of semester	8
Limited topic choices	7
Waste of time	5
Type of media	5
No disadvantages	4
Low weighting of assignment	3
Miscellaneous	11

The assignment was also seen as having value for revision, with students mentioning that it *"forced me to do some study"* and that it *"made you revise what [you] had learnt and listening to other people's was also good revision"*. Combining the number of students who commented about deeper learning with those commenting about revision brings the total number of students who noted improved learning to 56 (59%), including two whose comments fitted both categories.

Increased motivation was one of the anticipated outcomes of this new media assignment. Although students found it engaging (see the section on informal feedback below), this aspect was mentioned by relatively few students in the formal survey, perhaps because of the wording of the question which asked for the *main* advantages of the assignment (emphasis added). Nevertheless, motivation was alluded to by 8% of the students, who responded with comments such as *"got to present the information however you wanted, made it more fun"* and *"reco[r]ding is new and interesting. Opens up lots of options to be creative".*

Contextualisation was explicitly designed into the task but this advantage was mentioned in only 3% of the comments, for example by a student who appreciated *"exploring [the] topic in a way more applicable to real world [sic] rather than isolated facts"*. It would appear that students did not think deeply about this aspect of the assignment and also that many of the teams did not use the opportunity to its fullest advantage, making podcasts that basically presented material from lecture notes rather than researching an application of the concept in an area that interested them. This could be encouraged more explicitly in future assignments by providing relevant examples as well as including contextualisation in the marking criteria.

Group work featured highly as both a positive and a negative aspect. Thirty-five percent of respondents to the question on the advantages of the assignment focused on collaboration:

> *Talking about chemistry with other people – get a different perspective of [sic] the topic from other people*
>
> *A good group activity to bounce ideas off each other to allow a better understanding of the topic*
>
> *It has help[ed] me study and go through the topic. Also helped me work in a team.*
>
> *It was fun. Got to learn more about other people*

Not surprisingly, many other students found group work onerous, with 27% of the respondents to the question on the disadvantages of the assignment specifically focusing on group work:

> *Had to work with people you didn't know*
>
> *Group assignments are bad forms of assessment.*
>
> *Group assignments are a lot of both[er] and can be very stressful. Definitely should NOT do this assignment at the end of semester!*

These differing views of group work correspond with the authors' collective experiences of setting group assignments. While there are students who value working with their peers, others dislike working in a team for a variety of reasons, including differences in team members' expectations and motivations, and resentment at carrying 'freeloaders'. One specific objection made by a number of students concerned the practical difficulty of scheduling meetings (despite students having free biweekly lab slots):

> *Time consuming, especially as group projects are hard to schedule meetings etc*
>
> *Had a defective group that never seemed to be able to meet up*

These issues related to group work are likely to be faced by students in their working lives and so it is appropriate to incorporate group work into university assignments. It is possible that some training on the benefits of collaboration might be valuable, along with case studies illustrating how to work around blockages.

After group work, the most commonly mentioned negative aspect related to technical issues with recording or uploading the assignment. For example, one student wrote: *"uneven playing field in regard to technology access";* another remarked on *"not knowing how to use multimedia programs at the library";* and a third stated that *"the technology part was a bit challenging, particularly to upload it"*. It was apparent that some students lacked familiarity with new media in general and podcasts in particular, and some indicated a preference for using other, more traditional media formats; one stated simply that he or she *"would have rather written an assignment"*.

In fact, such comments confirm the value of introducing new media, which students may not have experienced previously but which might be important in their future educational and professional lives. At the same time, it seems that despite the various support structures in place and the lack of enquiries to the unit coordinator or lab demonstrators, there are some students who would benefit from further technical support. It may be that some students are hesitant to ask for help in this area, in which case more guidelines and information should perhaps be provided from the outset. An optional technical workshop would also be a possibility. Certainly, it appears likely that addressing these technological doubts could lead to an even more positive overall student reaction to podcasting tasks like the one set in this unit.

Even with technological issues addressed, some students may need more basic instruction about communication. While brevity is a common criterion for effective communication, 21% of the students who responded identified the difficulty of keeping their podcast to three minutes as a major negative aspect of the assignment.

> *Time limit means you can't actually explore the topic and I doubt they would provide a very good source for exam review because of this.*

Or, as another student put it, *"the final result was very simple because it had to be so short"*. This misperception that something short is necessarily lacking in complexity could be explicitly addressed in future by using some of this year's podcasts as examples, as well as making reference to the benefits of brevity in the assignment handout.

Some comments were very constructive, relating to logistical issues rather than the activity itself. Disadvantages identified included the low weighting of the task and a limited choice of topics, which could be addressed in future iterations of the unit. The timing was identified as a concern, with eight students recommending the assignment should be administered earlier in the semester. Interestingly, one student commented: *"it would have been nice to have [the assignment] earlier on to meet people and for an exemplar way for writing notes and learning the topic thoroughly"*. This suggests that the student recognised the benefits of the task for learning content at a deeper level – and perhaps for promoting collaboration as well.

Informal feedback

Informal feedback, which was not anonymous, was also collected from the class WebCT module. Although the assignment was worth only 5% of the overall unit mark, 94% of students were on a team that completed it. In many cases, the team put in a lot of effort. Because podcasts were submitted as attachments to discussion posts, there was the option to include a message. Several groups added messages like: *"Enjoy! ☺"*. Other humorous messages, such as *"no backing tracks were harmed in the making of this podcast"*, suggested that students found the assignment enjoyable.

In addition to the peer assessment exercise, some students made written comments on various podcasts. Without exception, these were positive. Examples included: *"That was one heck of a podcast! I really hope [the unit coordinator] chooses yours as an example! Great work!"*; *"Wow!! Loved it loved it loved it!!!"*; and *"Genuinely entertaining! I've had a listen a few times just for another laugh. Great job!"*.

Students also made posts about the podcasts in other discussion threads, encouraging their peers to listen to specific podcasts which they considered to be outstanding. For example, one student wrote: *"I just stumbled upon the most awesome podcast! Check out Wed 2-5 lab group, Alum4 AB; it will seriously be worth your 3 minutes!"* This post received a reply: *"Yeah big respect to this one…takes an uppercut!! Lol"*.

Conclusions

We are currently studying examination results for questions related to the podcasting topics. Preliminary observations of these results suggest there may be an improved understanding and learning of the 'acids & bases' and 'oxidation & reduction' concepts. If confirmed, this would be in line with the prediction that collaboration, contextualisation and (digital) communication of understanding should promote deep learning, including better retention of content knowledge over time. Students' own perceptions of the value of the podcasting task and reported mechanisms of behaviour and cognition also suggest that some deepening of learning may have occurred. Follow-on studies will involve designing and implementing clear measures of learning outcomes to test this. Marks given by the students and unit co-ordinator will also be analysed to investigate self- and peer assessment and how the new media task can be used to develop metacognition in students.

It is apparent that at the same time students were developing and practising important graduate attributes, in this case techniques for verbal, digitally mediated science communication, as well as the teamwork skills associated with a group task. Such skills will undoubtedly stand many of them in good stead in future educational and professional endeavours. In addition, there is little doubt that the task produced a considerable degree of motivation and engagement, as indicated in both formal and informal feedback. Such engagement is, indeed, something we would hope to find associated with deep learning.

In combination, the data collected to date suggest there is pedagogical and motivational value in introducing podcasting tasks in large science classes. Moreover, such assignments require minimal effort on the part of unit coordinators or demonstrators, and are an efficient use of limited teaching resources to provide engaging learning opportunities for students. This study demonstrates the feasibility and efficacy of the use of similar assignments in large, introductory science classes, particularly in times of shrinking budgets and staffing. Student comments on the disadvantages of podcasting assignments suggest that it is important to address logistical issues up front, perhaps in tandem with some explicit statements and learner training on the why and how of collaboration, contextualisation, and communication through new media.

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