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Descriptive Account

Text Messaging for Student Communication and Voting

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Abstract

Text messaging has gained widespread popularity in higher education as a communication tool and as a means of engaging students in the learning process. In this study we report on the use of text messaging in a large, year-one introductory chemistry module where students were encouraged to send questions and queries to a dedicated text number both during lectures and at other times when support with module material was required. Questions were answered either verbally during the lecture itself, at a subsequent tutorial or via a reply back to the student's mobile phone. SMS texting was also used as a rapid system for communicating results of a class test following a peer assessment exercise. With knowledge only of the student's registration number a text message can be sent to a dedicated text number and then forwarded by mail filtering rules to the recipient student's mobile phone. Finally, text messaging was evaluated as an in-class voting system to conduct short multiple choice quizzes on material being covered in a bioanalytical chemistry lecture without the need for bespoke handsets or specialist software. Students commented favourably on the use of text messaging in these contexts.

Keywords: Text messaging, student communication, electronic voting system, engagement

Introduction

The concept of using text messaging in academia has gained popularity in recent years and has permeated the various facets of higher education. Naismith (2007) reported on the effective use of text messaging in administrative communication where it was used to augment existing communication channels with students. Harley *et al*. (2007) report that communication with new students via text messaging has the potential to enhance the support given to students by academic departments during the transition period to university. They argue that text messages from staff appearing amongst those from the student's own social group can aid peer support and integration into university life. Further into the student's academic life, texting as a support measure has been explored for healthcare students during practice placements. Here students were offered a facility whereby they could contact the university by text message if problems or difficulties were faced whilst on placement. Staff would then respond to the message by the mode of communication which best suited the circumstance, by text, email or by telephone call (Young *et al*., 2010).

Apart from these measures to enhance student support, studies have also been conducted to determine the value of using mobile devices to encourage learning. A wide ranging review on the use of handheld devices in primary, secondary and tertiary education has been conducted and details the uses to which such technologies are put in a variety of educational contexts (Cheung and Hew 2009). Jones and Marsden (2004) report on the use of text messaging in the classroom context where students were encouraged to send questions or comments to the lecturer via text messaging thus encouraging a higher level of interaction with the material being delivered. Andrews *et al.* (2010) note that the increased ownership of mobile devices by students affords an opportunity to explore the links between formal and informal learning

and cites two case studies from the health sciences where this provided further support for students.

Aside from utilising user-owned devices, bespoke in-class voting systems which increase the interactive nature of lectures and enhance the learning process have been investigated. Mazur (2009) reflects on how interactivity in lectures has been increased using in-class voting technology, noting that the pedagogy around the technology is what is key in this context. Smith *et al.* (2009) describe how in-class voting systems allow for peer-discussion around a topic following which re-polling of questions causes the number of correct responses to increase. From their study on an undergraduate genetics course they found peer discussion enhances understanding, even when none of the students in a discussion group knew the correct answer.

A number of articles describe the use of in-class electronic voting systems to enhance the student learning experience and these have been implemented across a wide range of disciplines including business and marketing (Masikunas *et al.*, 2007), philosophy (Stuart *et al.*, 2004), physics (Beatty, 2004), psychology (Patry, 2009) and physiology (Sawdon, 2009). Draper (2009) describes how electronic voting systems combined with appropriately written MCQs can promote deep learning by focusing on learning relationships between items rather than just factual recall of disconnected items based on true or false responses.

In the majority of studies listed above bespoke voting systems comprising individual handsets for each student and a dedicated receiving device are required. However, other mechanisms for in-class voting have been described recently particularly the use of text messaging. Lindquist *et al.* (2007) found that text messaging worked well with multiple choice or short answer questions though students had some concerns about the financial costs of the approach.

We have used text messaging previously mainly for broadcasting announcements about a year-one introductory chemistry module as one of a number of support measures to engage year-one semester-one students and to help with issues around transition and retention (McClean *et al.*, 2006). In the current study we report upon the implementation of a two-way SMS texting service within an introductory chemistry module delivered to students taking biology, biomedical science, human nutrition, food and nutrition, dietetics, pharmacy and pharmacology degrees in the School of Biomedical Sciences at the University of Ulster. Students (n= ca.200) were encouraged to send questions and queries to a dedicated text number (88020, message prefixed with the module code) both during lectures and at other times when support with the module material was required. SMS texting was also used for student to student communication of results from a class test following a peer assessment exercise. Text messaging was further evaluated as an in-class voting system to conduct short multiple choice quizzes on material being covered in a mass spectrometry lecture as part of a year-one bioanalytical chemistry module. The system allows such quizzes to take place without the need for specialist handsets or software and students may be automatically sent a text message with additional follow-up information dependent on the answers given.

Methods

For this study we used the services of TxtTools (www.TxtTools.co.uk) for the implementation of a two-way texting service as a licence to use the product was already in place at Ulster. Each department concerned must obtain a license to use the text message facility, though an institutional licence provides much better value as a number of departments may then avail themselves of the service. The license is normally issued for one year and includes a few thousand text message credits, though additional credits may be obtained to 'top up' at any time. The cost per text message depends on the number purchased and we suggest

that interested readers should contact relevant companies for their most recent prices as a number of suppliers are available. The text messaging facility was provided as an additional communication tool to augment email and a Twitter page designed to broadcast announcements and module information.

Three specific uses of text messaging were investigated; staff to student communication, student to student communication and as an in-class electronic voting system.

Staff to student communication

An email-to-text and text-to-email facility was configured so that text messages tagged with the module code and sent to the dedicated text number (88020) were delivered to the module co-ordinator via email. By replying to this email the response was returned to the student's phone as a text message. This meant that the member of staff did not have to log into a separate online system to read and respond to messages, however care had to be exercised not to compose a text response greater than 160 characters as this would result in truncation of the message. Students were encouraged to send text messages to the academic member of staff during lectures and tutorials if questions arose about the material being covered. The lecturer could monitor these text messages arriving by means of a laptop in the lecture theatre connected to the email system thus facilitating a verbal response to the question in class. Students were informed that queries may be answered within the lecture or at a later tutorial session, or by a reply to the message by text. Students did not have to register to send questions, however to receive announcements about the module they had to opt-in to the system and supply their mobile number so that staff could contact them.

Student to student communication

SMS texting was also used as a rapid system for communicating results of a class test following a peer assessment exercise. With knowledge only of the student's registration number a text message can be sent to a dedicated TxtTools number and then forwarded by mail filtering rules to the recipient student's phone as shown in Figure 1. This required a separate mail filtering rule to be set up for each student on the module that had opted-in to receive text messages. While this was a time consuming step the value was excellent as it facilitated student to student communication without divulging mobile numbers to the cohort group. To evaluate the communication aspect of the service students were provided with an anonymous questionnaire on the use of text messaging at the end of semester.

In class voting system

Text messaging was further evaluated as an in-class voting system to conduct short multiple choice quizzes on material being covered in a three-hour bioanalytical chemistry lecture on the topic of mass spectrometry. Three short multiple choice questions were interspersed through the lecture, two relating specifically to the material and the third as a reflective question to gauge student confidence in their understanding of the topic at the end of the session. Again, students did not have to be registered on the TxtTools system to participate in the quiz.

The voting exercise required some preparation prior to the session to write unique custom labels to be tagged to each response provided by students. For example a quiz on ionisation methods had the possible response tags IonA, IonB, IonC or IonD while for a question on mass spectrometry sequencing the possible options were SeqA, SeqB, SeqC, SeqD etc. Students would participate by sending a message starting with one of these tags to the dedicated text number. The full set of tags used in the quizzes is shown in Table 1 and illustrates the fact that tags must be unique for the responses used in each quiz set, not just individual questions. Inbox labels on the TxtTools interface are then written for each response so that inbound messages beginning with, for example IonA, are tagged with the label 'IonA'. By comparing these labels a

pie-chart of responses is then generated for each possible response to a question generating a visual representation of how the class has voted. Despite this (minimal) preparation the voting system was very effective as a 'pop quiz' as no specialist handsets were required by students. Note that since first submitting this paper and now revising it for publication, TxtTools have significantly enhanced their voting interface making the process much more straightforward.

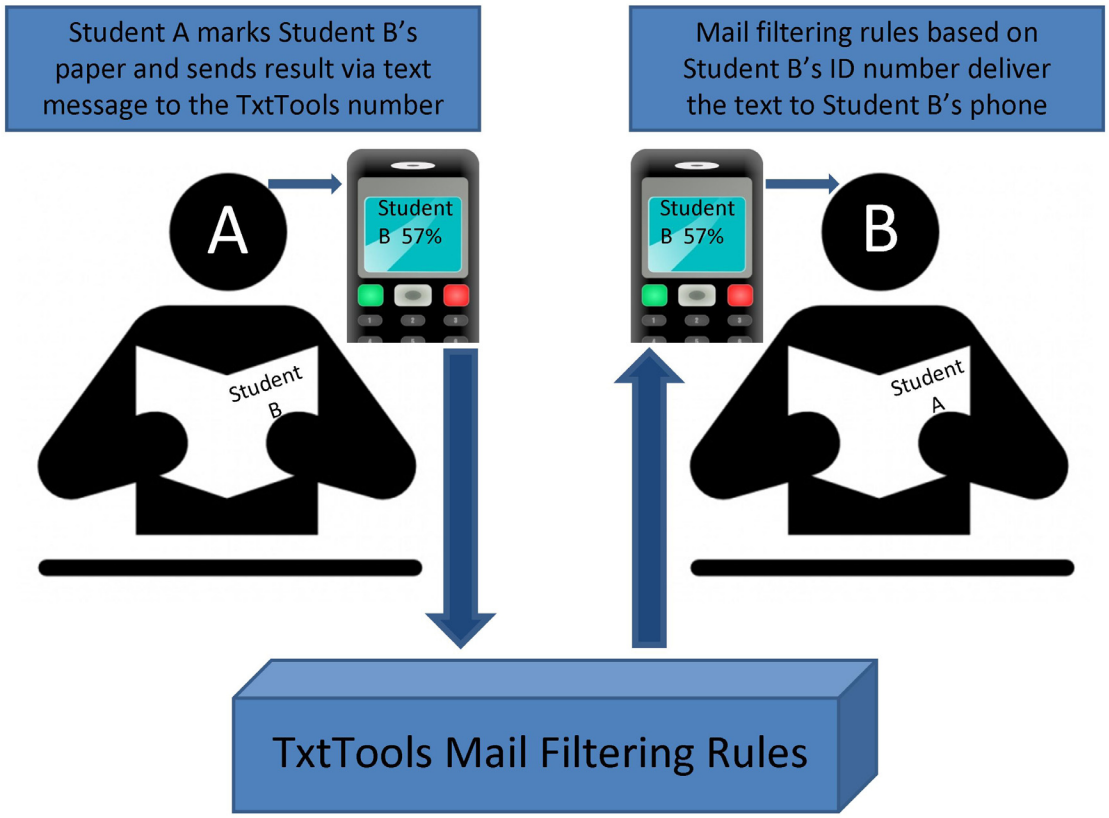

Figure 1 *The process of enabling student to student communication without divulging personal mobile phone numbers by directing text messages to a student's phone by mail filtering rules based on student registration number. This was used following a peer-assessment exercise so that students could receive their score as soon as the marking process had ended*

Answer	Answer Tags for Question on Ionisation Methods	Answer Tags for Question on Mass Spectrometry Sequencing	Answer Tags for Question on Student Confidence with the Topic
A	IonA	SeqA	MSA
D	IonB	SeqB	MSB
C	IonC	SeqC	MSC
D	IonD	SeqD	MSD

Table 1 *Possible voting options for a three-question quiz during a mass spectrometry lecture. Students text the appropriate tag to the TxtTools number. These create labels for the incoming text messages. Comparing the labels for each question generates a pie chart of responses*

The final question of the quiz related to students' perceptions of their knowledge of the material covered in the lecture and for these a number of automated responses were configured to provide additional support to students. A total of four different auto-responses were designed based on the four responses that could be submitted, these ranging from students being very confident with the material to those who still found the topic difficult and felt they had a lot of

work to do to understand the concepts. An appropriately crafted auto-response was then sent to provide advice to the student. The in-class text messaging voting service was evaluated using an online questionnaire after the bioanalytical chemistry module had ended.

It should be noted that in our study students without mobile phones were not significantly disadvantaged as the quizzes used were for formative assessment purposes and communication with lecturers was also possible by email. However, interested practitioners will need to consider mobile phone ownership if in-class voting is to be used for summative assessment in class.

Results

Students had to opt-in to receive text message updates from staff and 81% of the class (168/207 students) chose to do so. During the course of the semester 65 text messages were received from students on the introductory chemistry module. The content of these messages varied from administrative queries about timetables and room numbers, for example; “Do all students have to go to the tutorials tomorrow and Friday afternoon or are they optional?”. Some questions were about the topics to be examined in forthcoming class tests; “do we need to know anything about polynuclear aromatic hydrocarbons for the exam?” while others asked specific questions about material being covered such as: “What is the proper defination of colloid?” (sic) or “Does a problem not occur with half filled orbitals (stability)?”.

A few texts were sent during lectures but the bulk of the messages were received after lectures or tutorials had taken place. A Wordle of the main themes in the text messages sent by students is provided in Figure 2. Larger words represent more frequently texted themes. The words ‘chemistry’, ‘test’ and ‘tutorial’ were the three most frequently texted words during semester.

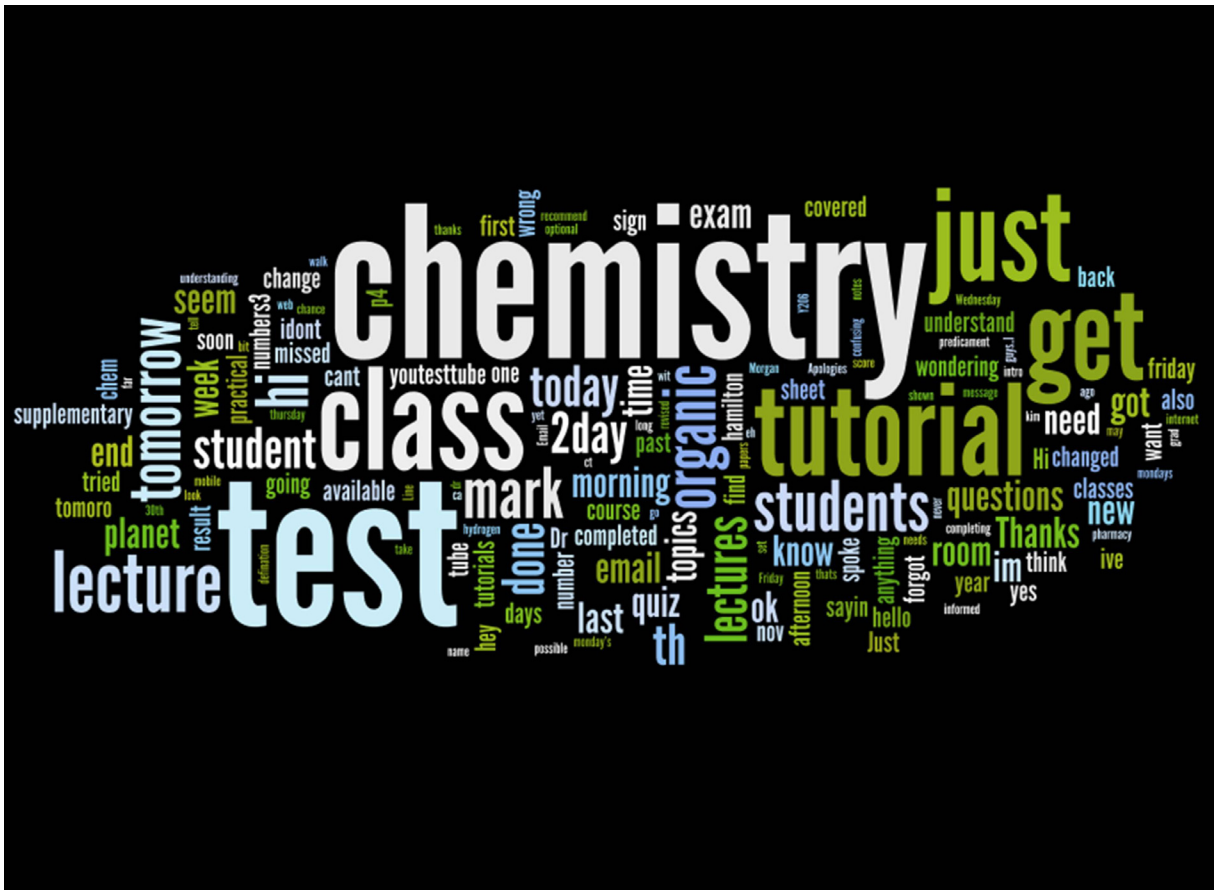

Figure 2: *Wordle of main themes texted by students in the introductory chemistry module during semester one 2009/10. Larger words represent more frequently texted themes. The words ‘chemistry’, ‘test’ and ‘tutorial’ were the three most frequently texted words during semester*

To evaluate the staff to student and student to student communication aspect of the service students were provided with an anonymous questionnaire on the use of text messaging at the end of semester and 123 responses were received. The text messaging facility was provided as an additional communication tool to augment email and a Twitter page used to broadcast announcements and module information. The questionnaires showed that 92% of respondents disagreed that communication with staff on the module was a problem with only one student reporting that they were unaware that text messaging support was available. In asking the group to evaluate their own usage of the facility during semester, one student claimed to have sent in excess of ten text messages while two students sent between seven and ten messages. Eleven percent of respondents sent between four and six messages while the majority (55%) sent between one and three. It was interesting to note that 31% of respondents did not send any messages at all.

Staff to student communication

When asked if texting was a useful means of asking questions about the module content 89% of respondents agreed or strongly agreed while 11% were indifferent. Of those who did send a text message 72% agreed that they received a prompt response to their query.

Student to student communication

Evaluation of texting to provide feedback of marks after a peer assessment exercise saw lower satisfaction with 78% of respondents agreeing that this was useful and 14% expressing indifference. Around 8% of students who responded disagreed that this was a useful exercise, this view being precipitated by the fact that not all students turned up to this event and so not all scripts were marked.

Some qualitative comments from students regarding the communication aspect of the project are given below:

"Very convenient. Questions were answered quickly."

"Useful when you can't always read emails."

"I thought it was an awesome idea. Keep it up."

"Include southern [Republic of Ireland] phone numbers"

"Make it free of charge please"

The final two comments underline two of the main barriers to students fully embracing the system namely cost and signal coverage. Signal coverage has an impact on inclusivity in that some students who were normally resident in the Republic of Ireland found difficulty in getting a signal inside the lecture theatre. Indeed the issue of signal reception should be borne in mind as lecture theatres that are located in basements or in the centre of a building may have poor mobile phone reception and therefore be unsuitable for this type of exercise. In addition, students may not wish to take part if they feel that the financial cost to them is prohibitive. However, as many students have inclusive text messages as part of their monthly mobile telephone contracts, texting the occasional question or query should not prove too financially onerous.

In Class Voting System

As evidenced by text responses received 46, 42 and 30 students respectively took part in three short voting quizzes during a mass spectrometry lecture as part of a bioanalytical chemistry module. The exact number of students present within this session was not recorded though the total number enrolled on the module was around 130. These multiple choice quizzes were

interspersed throughout a three-hour lecture, two questions relating specifically to the material and the third as a reflective question to gauge student confidence in their understanding of the topic at the end of the class. An example of one of these questions and the voting options is shown in Figure 3a. When voting had taken place a pie-chart of responses was generated as a visual representation of how the class has voted as shown in Figure 3b. Such a presentation of data allows the teacher to react immediately to the fact, in this case, that a large proportion of students are not confident with the material being delivered. This allows for reinforcement of key facts, or by asking students which areas need to be revisited and explained again.

a) Please let me know how confident you feel about the topic of mass spectrometry...

MSA = VERY: no problem at all; bring on the practical!
MSB = CONFIDENT: getting there ok
MSC = NOT CONFIDENT: but know that I can get there with more study
MSD = NOT AT ALL: I really need more help

b)

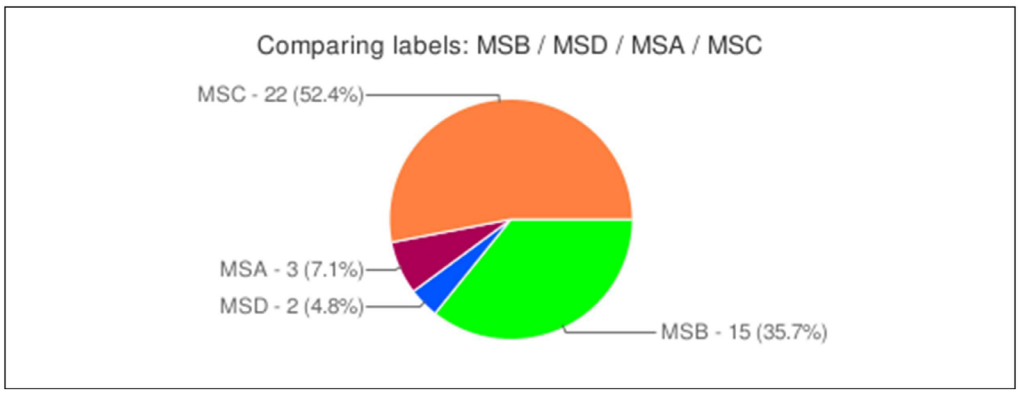

Figure 3a *Typical question used for in-class voting exercise and the options that should be used in voting (MSA, MSB, MSC, MSD)*

Figure 3b *The pie-chart output produced by the TxtTools interface is displayed on a webpage and is shown in the boxed area above*

A separate evaluation of the text message voting project was carried out using an online survey and 40 responses were received. Students were asked about the number of quizzes they had participated in. This revealed that 27.5% of respondents had completed all three, 25% two quizzes and 32.5% participated in just one. In all this resulted in an 85% engagement with some aspect of the text message voting by the respondents. Some 90% of students surveyed indicated that they always brought their mobile phones to class with a similar number agreeing that the process of voting was straightforward. The data for the majority of these evaluation statements is presented in Figure 4 and summarised here. Respondents generally agreed that the procedure helped keep attention in class (87.5%), and most agreed that they didn't mind sending a few text messages to take part in the quiz (82.5%). Around 90% of respondents would like to see the process of text messaging extended to other classes and modules but only 45% agreed that they would prefer to use a handset for voting instead of their mobile phone. That said, less that 30% disagree with the statement so a majority of respondents indicate a preference or would not object to using handsets instead of mobile phones. It may be that this was the first introduction to in-class voting for many of the student group and they would not have had opportunity to experience the use of handsets and mobiles to draw an objective

distinction between the two technologies; rather they may have expressed preference only on the technology they were accustomed to using.

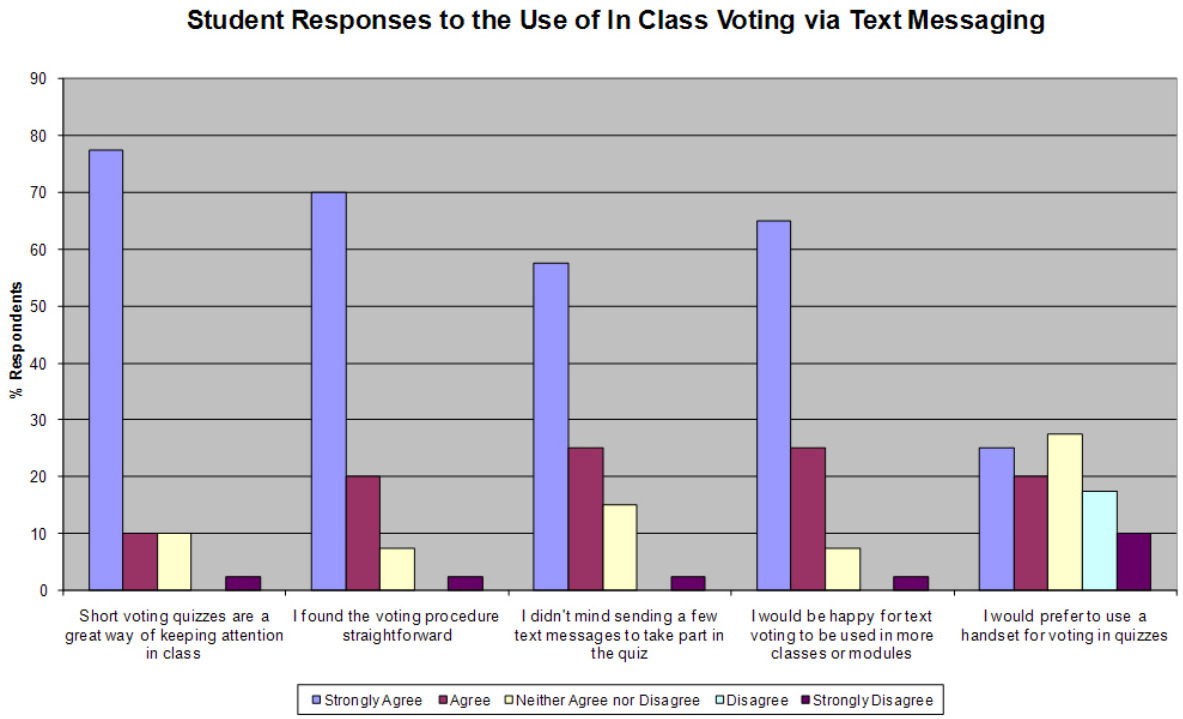

Figure 4 *Graph showing student responses to the use of in class voting using text messaging by responding to a number of qualitative statements*

Some of the free-response comments received from students are provided below:

> *"I think it's an excellent way of keeping attention during the class. Often lectures are extremely long and it's very easy to lose concentration, this was an exciting way of learning and was better than having to sit and listen. Student Participation is always great."*

> *"I think texting is a great way of gauging an understand of how the class is understanding and receiving a lecture, but it also keeps us entertained and attracts our attention. Maybe you could do more competitive things like Nutrition vs. Biomed because we always try to outdo each other. And I've free texts so I'll answer them all!! [sic]."*

> *"I would be happy sending any amount as I have unlimited texts on my mobile contract, may feel different if the cost was greater. [sic]."*

As highlighted above, the cost of voting and also sending queries by text message rests with the student and is charged at the normal rate levied by the mobile phone company. Students were asked how many text messages they would be prepared to send as part of text message voting and the response ranged from five per semester to in excess of 100 per semester. One student commented:

> *"Maybe about 5-8 [texts sent] per semester but the handsets for voting could be used more often as it is free and quicker. Could be used for a short quiz at the end of each lecture."*

This pragmatic view is however at variance with the rest of the cohort as most said they would prefer to use their mobile phones rather than bringing a handset to class for voting purposes.

Discussion

This study highlights the enhanced communication potential that text messaging provides between students and students and staff in higher education. Pew Internet discovered that in a survey of American teenagers 84% of those questioned had a mobile phone by the age of 17

while mobile phone ownership by adults has risen to 85% (Lenhart, 2009). Igarashi *et al.* (2008) in a study entitled 'No mobile, no life' investigated the phenomenon of 'texting dependency' among Japanese high school students where many admitted to taking their phone to bed so as not to miss a late-arriving text message. As mobile devices are almost inextricably linked to the learner, albeit primarily for social communication rather than education, the connectivity and social adhesion facilitated by text messaging provides a strong sense of community between students in their peer group. Anecdotal evidence suggests that the phenomenon is not geographically restricted and therefore the use of this supportive technology could be readily transferred to various educational contexts in a variety of cultures.

In our evaluation of the texting service no student complained of not having a mobile phone; however signal strength in the lecture theatre was an issue for some depending on their mobile phone provider. That said the texting facility was designed not for use solely at lectures but also at other times when support was needed. Communication with students was also possible by sending bulk text messages to the entire module group thus ensuring timely communication of urgent announcements such as the cancellation of a lecture due to staff illness etc. The two-way nature of the system means that meaningful communication was facilitated rather than using text-messaging as a uni-directional broadcast medium.

As mobile telephone use is ubiquitous particularly among students, asking a question about module material is now much more accessible particularly for students who are reluctant to participate in class. There is no need to be at a computer, and students can quickly send a text message if a query arises during revision for class test or in surveying the module notes. This is relevant particularly for year one students who are finding their feet in a daunting learning environment. Of course, students should be made aware that the promptness of response will be dependent upon the availability of the lecturer at the time the message is sent. To that end staff should communicate to students how and when messages will be handled especially those sent out of normal office hours,

In our practice students had to opt in to receive announcement messages from staff. While student participation was not compulsory we found that once their colleagues began to receive messages about the module others who had not opted-in had a greater motivation to take part and so signed up. This again demonstrates the influence of the social group to bring about a supportive environment.

The use of text messaging to convey results from a peer assessed class text was introduced in an attempt to enhance the process of communicating results to a relatively large cohort group. Here the majority of students felt that this was useful and technological interventions such as this may go some way towards redressing the fact that only 53% of students in Northern Ireland higher education institutions taking part in the 2009 National Student Survey felt that feedback on assessments was prompt (NSS, 2009). Some students who did come to the session marked scripts and then provided the final mark by text were doing so for absent colleagues while they themselves did not get their script marked or receive a result. It is realised that this issue was by no means related to the technology but rather student engagement with the peer assessment process. It may be more useful to organise these sessions so that the marking of scripts happens directly after the class test so as to maximise attendance.

Using peer assessment combined with automated feedback mechanisms such as text messaging may help to enhance the feedback supplied to students. Indeed, lecturers may now choose to send feedback on student work via text messaging as a further means of enhancing feedback, though skills in writing concisely will need to be developed given the limitation in the number of characters that may be used. The fact that providers such as

TxtTools often incorporate a mail merge facility as part of their suite of tools means that bulk texting of messages with student-specific information is therefore possible and efficient for large numbers of students.

In our experience voting using text messaging has proved effective and does not require students to have additional handsets. All such in-class electronic voting system build a network within the class which, as Davis (2003) notes, allows the teacher to see what all students are thinking not just the relative few who verbally respond to questions in class. This allows the lecturer to respond to deficiencies in knowledge within the group or to perhaps correct conceptual misunderstanding that may arise in dealing with complex scientific theory. Electronic voting may also prompt discussion within the class around topics as students naturally confer with their peers when presented with a problem (Smith *et al.*, 2009). Voting by text messaging also means that students may participate even if absent from the lecture theatre. In fact, when demonstrating the facility to colleagues one of us (SMcC) was able to receive votes from colleagues on two campuses approximately fifty miles apart during a meeting taking place by video conferencing. This further underlines the usefulness of the technology to engage distance learners who may feel isolated due to their geographical location.

However, with text message voting students must pay to send the text message and signal coverage is not always optimal. These facts should be borne in mind when designing activities and should be looked at holistically across departments especially if summative assessment is to be used based on text voting. In addition, the interface for text voting for some providers is currently not at the same advanced level of development as that offered by in class voting systems using handsets. These integrate well in most cases with Microsoft PowerPoint which is currently not the case with all text message based voting systems. Some providers of voting technology now provide multiple platforms for voting including wireless devices such as the iPod Touch, iPhone and Blackberry alongside web based voting and text messaging (Stav *et al.*, 2010).

In our study the majority of students enjoyed the process of taking part in voting claiming that it helped keep attention in lectures. This view correlates with research carried out by Dengel and Wang (2008) though they urge caution recognising the need to ask appropriately written questions to engage students in higher level thinking. This vital pedagogical principle will move the voting system beyond a simple entertainment device in lectures.

In our hands texting technology has provided an excellent means of engaging students with module material and providing support through this additional channel of communication. Our main impetus was to engage students and to facilitate feedback in their learning. Voting and answering questions in class could be incorporated into larger course projects and initiatives for student engagement such as games for feedback and learning where students in groups compete in class to earn points for their team (Charles *et al.*, in press).

The concept of a two-way texting system can be readily transferred to other disciplines and have various applications as described above. The ubiquity of mobile telephony and associated text messaging is something that cannot be ignored as mobile learning advances apace.

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