

Observing Emerging Student Networks on a Microblogging Service

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Abstract

The impact of social networks on lives of the majority of young adults has been enormous, although their impact on education is less well understood. Some consideration has been given to the role Facebook plays in higher education and in the transition from secondary to tertiary education, but little analysis has been conducted on the role of the microblogging social network Twitter. By examining the use made of this service by two cohorts of students, this study found that Twitter is easy for students to use and popular with the majority once they have experience with it. For this study different patterns of use between individuals in the study and between the two different student cohorts were observed, as was the emergence of informal online peer support networks. The results of this study suggest models for future use of microblogging services.

Keywords: computer-mediated communication; cooperative/collaborative learning; Twitter, learning communities; learning spaces, microblogging

Introduction

For some time, students have used their mobile cell phones to maintain local and distant networks whilst studying at university or college. Over time, phones have added other forms of social connectivity and information access to their functionality, and have now been joined in the student backpack by a personal digital assistant ("PDA"), laptop computer, or other wirelessly connected device. Smartphones and touch-screen devices (such as the iPhone and iPod Touch) have high usability ratings and provide a wide range of internet services to users (Nielsen Norman Group, 2008). Some tools or applications can be used across devices and offer ways for students to interact as they work and move around between campus and halls/home. Social networks play an increasingly important role for teenagers. About half of U.S. teenagers use Facebook and 37% access the Web on their phones (Nielsen Norman Group, 2009b). It is commonly believed that young people prefer SMS (i.e., Short Message Service or text) messages over online social networks because texting offers the privacy of a one to one conversation (Boyd, 2009). However, they are sophisticated in their choice of online networks, choosing different networks for different audiences and spheres of influence while maintaining a range of overlapping online identities (Selwyn, 2009).

Use of the Twitter microblogging service has grown more than 10-fold in the last year, and the largest number of users are aged 25-54, not the typical student age group (Nielsen Norman Group, 2009a, 2009c). Such is the success of Twitter that the UK Government Department for Business, Innovation and Skills recently produced a 20 page manual for using Twitter as a low-risk and low-resource channel for corporate communications (UK Government Department for Business, Innovation and Skills, 2009). In light of these social and technological developments, this paper describes a study that took place across two student cohorts (one science undergraduate, one arts taught postgraduate) at the University of

Leicester. Participating students were provided with a multi-application mobile device (the iPod Touch) and the study investigated their use of the device and their interaction using the microblogging service Twitter (twitter.com). The latter served additionally as a data gathering tool, which was used in this pilot study for this purpose, and in order to investigate its potential as a new communication channel for students and academic staff.

The primary aim of this project was to investigate the usefulness and affordances of microblogging within a Higher Education environment. In particular, we sought to investigate whether Twitter could be used to enhance student engagement, with a view to describing possible models for future use in the higher education context. A secondary aim was to stimulate debate and investigate the power of microblogging and data capture to inform new areas of research into the student experience.

Literature Survey

The basis of what this study attempts to investigate originates from Etienne Wenger's work on communities of practice (Wenger 1998, 2010). The use of microblogging services by students is a new area for research and there are relatively few formal studies published specifically on the topic of Twitter in education. However, the benefits of using a microblogging service for data collection have previously been described in a study which found that Twitter provided light-hearted but insightful information about how students' university, home, and social lives blend together (Aspden & Thorpe, 2009). Stieger and Burger (2009) attempted to use Twitter for formative assessment. Ebner et al (2010) found that the use of a microblogging tool in a course to foster informal learning gave students the opportunity to be a part of someone else's process by reading, commenting, discussion. Similarly, Martin (2010) found evidence of potential for informal learning through the medium and created a categorisation of different responses (including comments about the course, private messages, hyperlinks etc). These preliminary reports give sufficient encouragement that the use of Twitter should be investigated in a range of higher education contexts.

Considerable evidence demonstrates that Twitter is capable of use as a collaborative medium rather than the vanity-driven status updates which are often discussed (Honeycutt & Herring, 2009). Twitter is a "noisy" environment, due to the large number of tweets and the speed with which they are posted. However, the "noise" represents diversity and supports serendipitous discovery which keyword or phrase-directed searches cannot. Twitter operates rather like a wiki, as a knowledge-sharing, co-creation platform that produces content and allows its consumption (Drapeau, 2009).

The nature of mobile devices means that they score highly for flexibility, but other than for audio and video, are poor input devices. For example, it is challenging to enter large amounts of text (Nielsen Norman Group, 2008). The use of a microblogging service (140 character text messages of a similar length to mobile phone SMS messages) enabled this study to assess the usability and flexibility of a short text-based system on these devices. The iPod Touch was chosen for its superior accessibility over other mobile devices (see below), ease of use (Almpanis & Bruce-Low, 2009), multi-mode nature (audio, video, games, internet, e-mail, etc.), the ability to install a wide range of applications easily, WiFi capabilities, and for its attraction as a device to students (helping to encourage participation in the project). The main shortcoming is the iPod's lack of phone/internet connection other than via WiFi. While the limitations of the user interfaces of many mobile devices affect accessibility, in particular in terms of visual impairment and reduced hand-eye co-ordination, mobile devices such as the iPod Touch score highly for students with limited mobility and for mature students and/or those living at a distance from the campus (they can be used while students are in transit, e.g. on public transport, or in multiple locations). For students with hearing problems, text-based microblogging services are far superior to any audio communication systems.

Methods

Microblogging services are available on a wide variety of platforms, including mobile phones (native format on smartphones and via SMS on older phones), web interfaces and desktop clients. Twitter was selected for this study as the sector-leading microblogging service to offer stability and integrated technologies (such as services which post photographs, longer texts or videos). On several mobile devices there are a wide range of free Twitter clients available, but the service is also available via a simple web page and via mobile phones through SMS. Free internet applications for desktop/laptop use are also available, such as Twhirl and Tweetdeck, or via a standard web browser using free plug-ins such as Twitterfox for Firefox. This ensures that users of the service are able to connect to it in a number of ways, independent of location or owned technology.

The project was carried out at the University of Leicester, UK. Data generated by students using a microblogging service have not previously been investigated at the University. The iPod Touch devices were used by two different cohorts of students. The first group of participants were campus-based first year undergraduate students in the School of Biological Sciences, all 18-19 years old, who participated during their first semester of higher education. The second group were campus-based postgraduate masters-level Museum Studies students who ranged in age from 21-41, participating as part of a Digital Culture module in their second semester of the course. Five staff members were involved in supporting and promoting the project: two academic staff members, one from each department involved, two e-learning technologists and one member of the central Student Support and Development Service. The study design was approved by the University of Leicester Committee for Research Ethics Concerning Human Subjects prior to commencement.

Participating students who volunteered from the two cohorts chosen were asked to post messages ("tweet") at least four times per day, e.g. "I am in the library writing an essay for module x". It was planned for the ten devices available to be rotated through the two groups of students in order to build a picture of the uses and potential uses students would make of the Twitter service as distinct from other online social sites such as Facebook, etc. By rotating the devices through the two student cohorts, we aimed to determine the affordances of both the iPod Touch devices and the twitter microblogging service for educational and social purposes, and as a secondary aim, as a means of data collection for exploring the student experience. Students were selected at random from each group to keep the iPod Touch devices at the end of the project to incentivise recruitment. Cohort sizes were determined by the number of devices available (maximum of ten). Each cohort of students were loaned the iPod Touches for four weeks; the students recruited were very enthusiastic about using the devices. The two cohorts readily added a unique hashtag (a community-driven convention for adding metadata to tweets) to label their tweets and all were rigorous about using it in all their messages.

The main analyses of data from the study groups were performed using freely available tools. Students' messages were collated and archived via the RSS feed from the designated hashtag using an RSS aggregator (Google Reader), since Twitter content does not remain publicly discoverable indefinitely. A measure of the student networks was made by counting the number of followers and following accounts listed on their profile pages. Only messages containing the hashtags were collected and analyzed, leaving students free to use additional channels via untagged messages if they so desired.

The evidence collected online was supported by a short online survey administered at the end of the data collection period that asked the participants about their previous experience of Twitter and their impressions of using it on this project. All but one of the study participants were new to Twitter and had not used it or any similar microblogging service previously, although the majority did regularly use other social networks such as Facebook. The study participants were provided with online training materials via a project wiki (<http://walls.wetpaint.com>) but the iPod Touch devices proved to be very intuitive and very little instruction was needed beyond the initial set up which was done in a short face to face meeting.

Results

All data has been anonymized to protect the identities of participating students. The undergraduate cohort is indicated by a U prefix (e.g. U001), the postgraduates by P and participating staff by S.

Analysis of Twitter use

Table 1 shows an analysis of Twitter use by the two student cohorts. The average number of tagged messages per day varied from 1 to 10, with a group daily average of 5 for the undergraduates (1082 in total) and 2 for the postgraduates (699 in total). All of the study participants used more than one client to access the Twitter service, the average number of clients used being 4. Since some of the preferred Twitter clients were not available on the iPod Touch, this indicates that the Twitter service itself was the most attractive aspect of communication rather than the device. Analyzing the content of the messages revealed that they were sent from across the University campus, student halls, cafes, bars, on busses and any other locations where students were working or networking, and the client used was the most convenient one at the time.

Undergraduate cohort

Figure 1 shows an analysis performed of the tagged Twitter data collected using the freely available AGNA (Applied Graph and Network Analysis) social network analysis tool (Betna, 2005). AGNA visualizations of network interactions are based on graph theory, where a network consists of a set of

nodes (in this case, Twitter users), connected by ties known as edges. The size of the network depends on both the number of users and the number of connections between them. These measurements allow the relative complexities of networks to be analyzed.

Table 1. Analysis of Twitter use by two student cohorts.

Student	Average number of tweets per day	Number of interfaces used ¹	% of @ replies
U001	5	5	14
U002	10	6	58
U003	4	6	2
U004	3	3	11
U005	3	5	22
U006	5	7	21
U007	7	5	40
P001	1	n/a	5
P002	1	2	0
P003	1	2	4
P004	1	2	23
P005	1	4	16
P006	3	3	12
P007	2	2	2
P008	4	3	39

¹ Twitter clients used included: Hahlo, Mobile, Natsuliphone, Tweetdeck, Tweetstats, Twhirl, Twittrific, Twitterfon, Web.

This analysis indicates a rather peer-centred network with participating staff less central and less highly connected than some of the undergraduates. However, the number of replies to other study participants totalled 9%, with the majority of the tagged messages being simple status updates. Addressivity (via @replies) on Twitter is a user-generated convention which creates cross-turn coherence - sustained, topic-focused, person-to-person exchanges. Nevertheless, peer support emerged as a key feature of the undergraduate student network, with activity rising just prior to assessment deadlines or during revision for exams. There was clear evidence of personal learning networks emerging in this cohort, such as students using the network when they were preparing assessed work or revising for tests, often in situations when they were physically isolated from their peers. However, they frequently used the service to arrange social meetings in cafes, for lunch between classes or evening social events. No public incidences of students using the service to collude on answers for assessments were detected, although students have many additional private communication channels. Some examples of messages posted during the project include:

- *Doing metabolism questions over msn, testing each other is a fab way to learn! If only I knew any answers.*
- *Has the words 'russian bride' written on his hand, and can't remember much of last night.... Now for chemistry revision.*
- *Is rather worried about the assessment tomorrow and is preparing herself for failure.*

Approximately half of the undergraduate cohort of students involved in the project have continued to use Twitter without the iPod Touch devices, demonstrating that this personal learning network, or emergent community of practice, has become established. This was an unexpected but welcome outcome of the project which indicates that the attractiveness and flexibility of the Twitter microblogging system clearly outweighs the impetus provided by the provision of the iPod Touch devices to these students, or requirements of the project itself.

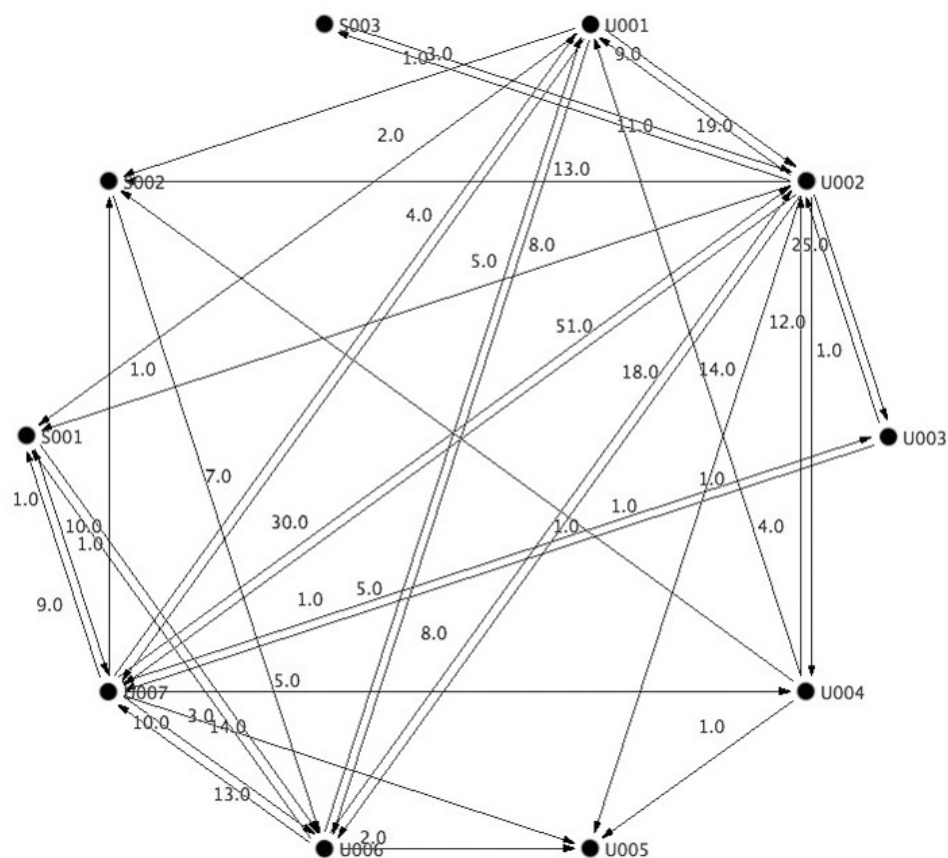


Figure 1. An analysis of the tagged Twitter data collected from the undergraduate student cohort performed using the AGNA network analysis tool (Betna, 2005). All data has been anonymized to protect the identities of participating students. The undergraduate cohort is indicated by a U prefix (e.g. U001) and participating staff by S.

Postgraduate cohort

The postgraduate group was drawn from a Digital Culture module in Museum Studies, and eight of the ten students on the module agreed to participate. All eight students actively used the devices and Twitter. In addition to the location statuses, they utilised the technology to co-ordinate face-to-face meetings, comment on sessions and teaching, share online resources and findings, and to report on independent project work. Figure 2 shows an analysis of the tagged Twitter data collected performed using the AGNA network analysis tool.

This network was less active than the undergraduate cohort (individual daily average number of messages of 2 compared with 5), and is also rather more tutor-centred than the undergraduates, with less online peer communication. The proportion of @replies to other participants was 21%, the majority of these directed at and from students and staff, with rather less evidence for the emergence of online peer networks than in the undergraduate cohort. The probable reason for this was the prominence of small group face to face meetings in this cohort. This did, however, mean that a personal learning network built up around some students, surrounding and extending issues covered in the face to face meetings. The tutor-student interaction centred around administrative details (changed rooms or one-off events) or arranging consultation meetings; one interesting use of wider networks arose during a fieldtrip to London during a snowfall - tweets were exchanged with other museum staff to arrange alternative venues during the day.

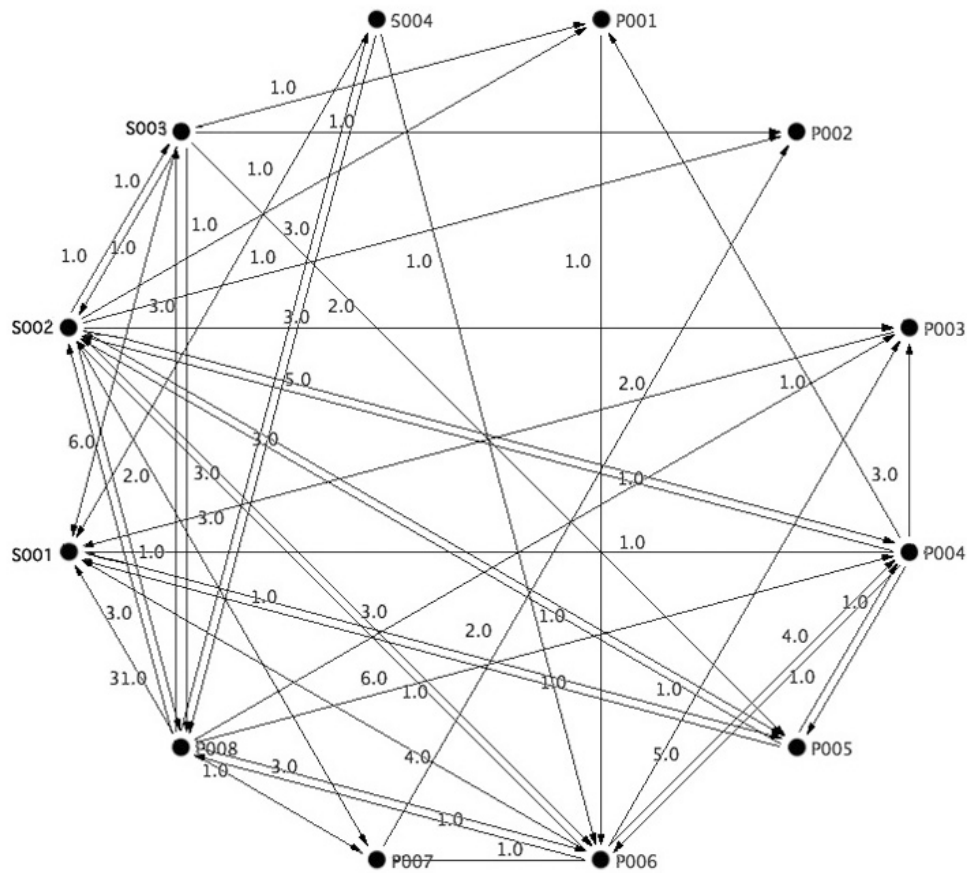


Figure 2. An analysis of the tagged Twitter data collected from the postgraduate student cohort performed using the AGNA network analysis tool (Betna, 2005). All data has been anonymized to protect the identities of participating students. The postgraduate cohort is indicated by a P prefix (e.g. P001) and participating staff by S.

Some examples of messages posted during the project:

- Got up at 7 and look the black sky out of my window. Just browsing the website of National Sports Museum <http://www.nsm.org.au/>
- Enjoyed reading the theory and coming up with realistic ideas. Group worked quickly, good to see what could be achieved in few hours
- Reading about kandinsky and art and music. How apt on an iPod.
- Was thinking about watching the Games & Museums lecture together on Wednesday the 4th of Feb. If you want to join text/facebook me.
- Never knew museums tweet too. Apparently even the whale on the ceiling of the nat hist museum in NY!

Survey results

As a qualitative tool, a voluntary survey was conducted to assess responses of the students to the device and to Twitter. The overall response rate to the survey was 73%. None of the respondents reported that they were previous regular users of Twitter, only one had tried it before starting the study and 4/15 had never heard of Twitter. All of the respondents stated that they used Facebook regularly and a third used some other form of social networking sites (in particular MSN or similar chat systems). The participants

were asked "Which aspects of study or free time did Twitter affect?": undergraduates and postgraduates were similar in their responses to this question, citing a broad range of uses. However, there was a markedly different response when asked whether they would have used Twitter had it been available from the start of the course, with the undergraduates stating that they would have (5/6) and the postgraduates stating that their use would have depended on others using it in their group (4/5). In both cohorts, students were explicitly aware that academic and support staff were subscribing to the Twitter stream and participating in the conversations that were ongoing between the students. When asked about this observation by staff, students responded positively with only 4/15 respondents stating that they tried to keep their tweets academic and non-trivial, and no-one chose the response "I didn't like the fact that our tutor was watching what we tweeted". Almost half of the respondents (7/15) did state that "I thought carefully about the subject/wording of my tweets before posting" and the same number responded that they "liked the academic feel [the tutor's presence] gave to our group". The clear implication from this limited sample is that the students liked using Twitter, found it useful, and did not find the presence of academic staff intrusive, and indeed frequently used Twitter in preference to alternative channels such as e-mail to contact tutors to ask questions or arrange meetings. The first year undergraduate students in particular were very open in their Twitter postings and a strong community soon grew between those using the devices. Nevertheless, these students were conscious that their messages were public and exercised mature self-editing in their online behaviour, with no incidences of inappropriate content being posted during the project.

The survey also asked the participants about their impression of the iPod Touch. In addition to use as a Twitter/internet device, most of the students also used it to listen to music, watch videos on YouTube and for many other purposes (e.g. maps, calendar, notes). Most downloaded applications from the online iTunes Store, but only free applications rather than any which required payment. These activities show that the students were not adverse to using a particular device for a mix of personal, social and academic

Discussion

Previous analysis of Twitter networks reveals that "indegree" ("incoming") connections predominate over "outdegree" ("outgoing") connections (Java, et al., 2007). Thus it makes sense to attempt to foster Twitter networks at the level of academic units such as degree streams or courses. However, for long term sustained use, outdegree connections are important - will participants continue to use and benefit from the service after the course is over? Zhao & Rosson carried out a qualitative study of employees in a large corporation who have integrated micro-blogging into their own practices, using the Twitter microblogging tool (Zhao & Rosson, 2009). This study emphasises the importance of capturing informal conversations - the "water cooler moments". Informal communication at work may provide an important role for collaborative work, peer support and organizational innovation. A greater proportion of novel information flows to individuals through weak than through strong ties (Levin, et al., 2002). Weak ties are the most common social relationships that people have in online social networks.

In contrast to connectivity graphs of Web hyperlinks, where popular pages (authorities) and pages with many references (hubs) are distinct, in online social networks there is a high degree of reciprocity in directed user links (Mislove, et al., 2007). Social network users form links for one of several reasons. They may be connected by real-world acquaintances, online acquaintances, or professional (academic) contacts; they can share an interest; or they can be interested in each other's contributed content. Some users even see the acquisition of many links as a goal in itself.

Online technologies such as social networks impact more on large groups than on smaller ones - just because students sit in the same lecture theatre does not mean that they communicate with each other. This study clearly shows that undergraduate students are willing to use new channels such as Twitter in surprisingly sophisticated ways to open up additional possibilities in their education. These new technologies also present challenges to teaching and support staff in contact with students. Several (but not all) of the staff involved with this project were existing Twitter users with substantial online networks prior to the commencement of the project. After considerable debate, the staff involved decided to create new dedicated Twitter accounts for the purpose of communicating with students (in particular, with undergraduates), so as to avoid bombarding them with the information overload and seeming irrelevance of the high traffic generated by a mature network. This presents the problem of maintaining multiple online identities (Twitter accounts). It is an open question as to whether this tactic will remain necessary or even advisable as the penetration of Twitter into the online social space grows and more students are users of the service before entering higher education. At some point, staff may wish to protect their professional online identities from the "intrusion" that student support represents.

Conclusions

A number of potential uses for microblogging within Higher Education contexts have emerged from this study, and which warrant further investigation and development:

- Peer-to-peer support for academic and/or social aspects of University life, particularly during the first semester of study.
- Support for and around particular subject strands and cohorts, forming nascent communities of practice between the students and tutors.
- Administrative uses - such as broadcasting details of room or timetable changes; latest events; or between students (arranging meetings, discussing projects etc.)
- Adding an extra dimension to time and/or location sensitive events, such as fieldtrips, public lectures etc.; allowing real-time discussion, feedback, programme changes, additional information, tasks, questions, etc.

Analysis of the two student cohorts described here reveals that Twitter is a popular social tool while retaining the ability to be a useful academic tool. Clearly Twitter is not intended to replace face to face or other forms of contact between peer groups of students and between students and academic staff, but our evidence shows that it is a useful adjunct to these other communication channels and in some circumstances, may be preferred to other channels. These results describe instances of peer support and administrative use as well as purely social online interactions. As to the issue of whether academic staff should be in contact with students via non-institutionally controlled social channels, the authors have seen no evidence that this is harmful or resented, and indeed have recorded highly sophisticated online behaviour in which students are quite capable of differentiating between communications with academic staff and with their peers. Although the iPod Touch devices were popular with students, required little or no training and showed a high degree of accessibility, it appears that the Twitter microblogging service itself was the main driving factor in students' enthusiastic participation in this project rather than any hardware used to access the service.

Although this paper describes the outcome of a small scale pilot study, the results are in agreement with analysis in previously published work conducted in different environments described above, which suggests that this data will be of value to other institutions. Providing students with a mobile device as an inducement to form and join online peer networks is unnecessary as the Twitter microblogging service itself seems to be the driver for online interaction rather than the technology used to access it. Even if Twitter is eventually supplanted by second generation microblogging networks, this conclusion is likely to hold firm. As a lightweight, low cost channel to communicate with and support students, Twitter has many advantages. The data collected as part of this project has provided many insights into the motives and concerns of students in higher education. Both of the academic departments involved in this study were so impressed with the affordances of Twitter that they have continued to use it in their pedagogic academic practices.

Acknowledgements

The authors gratefully acknowledge support from the Joint Information Systems Committee (JISC) TechDis HEAT3 scheme for this project (<http://www.techdis.ac.uk>).

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Manuscript received 17 2010; revision received 20 Feb 2011.



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