HOW AND WHY ARE STUDENTS USING TWITTER FOR #MEDED? INTEGRATING TWITTER INTO UNDERGRADUATE MEDICAL EDUCATION TO PROMOTE ACTIVE LEARNING.

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Abstract

The deluge of online educational resources combined with ubiquitous use of social media has transformed the culture of medical students. Twitter is increasingly being used educationally and preliminary evidence demonstrates positive outcomes. However, limited research focuses on undergraduate medicine. This study aims to gain insight into medical students' views on using Twitter educationally to inform effective applications within undergraduate medical education. A broadly qualitative methodology was adopted. Data were collected using 6 semi-structured interviews and analysed via thematic analysis. Results demonstrate student-led use consolidates, supplements and transcends the formal curriculum. Networking and sociality are significant features. Flow of personalised information and a fluent interface underpins use. Technological and social aspects influence engagement. In conclusion, medical schools could integrate Twitter to improve academic support, promote active learning and strengthen relationships with students to enhance learning outcomes; addressing needs and expectations of 'next generation' learners. Further evaluative and theory-generating research is required.

Introduction

We live in a digital world. Technology and the internet have transformed culture as they increasingly underpin communication, business and education. In particular, the emergence of Web 2.0 technologies such as social media along with increasing sophistication of mobile devices have driven high levels of adoption and engagement across society (Lafferty, 2013). For students, interacting online has become an extension of everyday life as it offers a medium to connect with likeminded individuals within a growing sea of rich information and innovative resources. The consequence is a shift in higher education learner profiles as current graduates enter the real world in a novel, advanced and connected global environment (Ramaley and Zia, 2005). Despite efforts to modernise and develop curricula we are left with an antiquated, traditional and linear model of education. Instead, educationalist Sir Ken Robinson (2010) argues a *learning revolution* is required to shift from standardised systems to fostering a personalised and supportive environment; recognising learning as an organic human process.

Medical schools now commonly adopt 'integrated' or 'problem based learning' curricula in response to more refined understanding of adult learning theory. Evidence demonstrates experiential learning leads to better prepared foundation doctors, therefore curriculum development has resulted in a greater emphasis on high quality clinical placements from an earlier stage (Illing *et al.*, 2008). Although the focus, structure and implementation of courses have changed it is hard to ignore that a reliance remains on a didactic and transmission-based model. This is partly due to the immense volume of scientific knowledge that must be acquired. In addition, large year groups reflecting the increasing societal demand for doctors, provide pedagogical limitation.

However, the more traditional aspects of the course need not be impersonal, disengaging and restrictive for students (Snell, 1999); online social technologies like Twitter have potential to complement and modernise medical education by adding interactive and collaborative dimensions. The effective integration of new instructional techniques is encouraged by the General Medical Council (2009, p. 51) calling for medical schools to *"take advantage of new technologies"* to deliver teaching. Nonetheless, this has been a slow and difficult undertaking. Although most clinical teachers are not philosophically opposed to using online technologies (Lindner *et al.*, 2002), educational uptake has been marginal and there appears to be resistance (Major, 2010). Pedagogically, the move must be from a transmission model to a constructivist, sociocultural and metacognitive model (Howell *et al.*, 2003). Therefore, medical education must evolve from a modernist to a post-modernist phenomenon, with the focus on the student as consumer, flexibility and global reach (Rumble, 2001). Regrettably for academics, involvement with the integration of innovative technologies is less likely to be considered in tenure and promotion decisions compared with traditional instructional changes (Howell *et al.*, 2003). Nonetheless, academics involved in implementing Twitter must ensure they have a thorough understanding of online pedagogies and insight into how and why students are learning. They have a duty to change their beliefs, culture, historical roles and inform institutional change.

What is Twitter?

Twitter is a real-time information network and microblogging service that enables users to communicate via 140 character messages known as tweets (Twitter, 2013). Its design as a vehicle for conversation and to share ideas and resources makes it an attractive medium for education. A report by Faculty Focus (2010) demonstrates

over one third of University educators in the USA use Twitter and over half of these employ it as a learning tool in the classroom. In this modern and digitally connected world, students can ubiquitously access channels like Twitter to ask a question, discover new information or gain feedback from their personal learning networks (Lafferty, 2013).

Effects of integrating Twitter in education

A number of themes have emerged exploring the integration of Twitter to instructional methods in higher education. Students perceive Twitter to promote a sense of community and thus collaboration (Wright, 2010; Clarke and Nelson, 2012; Domizi, 2013). The online interactions help build peer relationships and increase feelings of 'connectedness' to each other and course content (Pauschenwein and Sfiri, 2010). Junco *et al.* (2011) applied Twitter to promote active learning amongst students and demonstrated a positive effect on engagement and grades. Further research found the design and implementation of such teaching strategies are pivotal to successful learning outcomes (Junco *et al.*, 2013). Numerous evaluations have been conducted via pre and post-intervention surveys to investigate the impact of utilising Twitter in large lectures. The findings, which are overwhelmingly positive, demonstrate enhanced participation via amplification of discussion and communication amongst peers and with lecturers. (Elavsky *et al.*, 2011; Fox and Varadarajan, 2011; Andrade *et al.*, 2012; Birnholtz *et al.*, 2013; Cole *et al.*, 2013; Tiernan, 2013).

Twitter use in Medical Education

In general, Twitter has an increasing presence in the medical arena. Giordano and Giordano (2011) report it as the primary source of information sharing in healthcare

providers and Redfern *et al.* (2013) highlight increasing growth and reach of Twitter as a medium for the dissemination of health information and education globally. Forgie *et al.* (2013) have drawn on current literature to synthesise a 'twelve tips' practical guide on utilising Twitter for medical educators. Chretien *et al.* (2011) demonstrate Twitter use by influential physicians and Gilpin (2011) believes its design and professional focus make it favourable for online professional identity construction.

However, when using social media in education, teachers must proceed cautiously. Students are not receptive to faculty encroaching on what they view as their personal realm, they express a sense of separation between educational and social spaces online and suggest faculty involvement may be an invasion of privacy (Burhanna *et al.*, 2009; Roblyer *et al.*, 2010). In addition, how learning takes place in naturally formed microblogging communities is largely unknown (Gao *et al.*, 2012).

Furthermore, there is a noticeable gap in the literature surrounding the application of Twitter in undergraduate medical education and more specifically researchers are yet to investigate the informal and autonomous use of Twitter by medical students. For faculty, there appears to be a lack of robust guidance (Ryan *et al.*, 2004) and organisational support (Curtis, 2001) when developing and implementing online technologies. Furthermore, research suggests students see more potential in Twitter compared with the faculty who teach and mentor them (Roblyer *et al.*, 2010). This culture must change in order to realise the opportunities social technologies provide for a more active and personalised learning experience. Twitter may become yet another technology that had great potential for improving the higher education landscape but has not been integrated in an effective manner, thus negating any real impact (Roblyer et al., 2010). Finally, in a meta-analysis discussing the failure of internet learning to

inform practice in medical education, Cook (2009) argues we need to be doing high quality qualitative research which provides a rich description of context including perspectives of various participants.

Context

When reviewing the literature on using technology in education, the lack of information regarding context makes it difficult to apply the results to other settings and consequently difficult to inform practice (Wutoh *et al.*, 2004; Khan and Coomarasamy, 2006; Lam-Antoniades *et al.*, 2009). Cook et al. (2008), in a meta-analysis of internet-based learning amongst healthcare professionals, discovered most of the literature failed to describe key elements of context. Although research has suggested Twitter is a useful tool in education, a critical review article by Gao et al. (2012) raises important questions over the trustworthiness of current evidence. Analysis of twenty-one studies revealed there was commonly limited information regarding participants, settings, methods and type of data collected. Therefore the need for more methodologically rigorous research is evident. For this paper to be sufficiently robust to inform practice, the context must be described in detail.

In 2012, the student-led Newcastle Medical Education Society at Newcastle University (http://www.ncl.ac.uk/) started a Twitter account (https://twitter.com/MedEdNcl), username @MedEdNcl, as a platform for educational activity and social interaction amongst peers. The initiative proceeded to grow as prospective students, doctors, educators and other medical students around the country began to contribute and engage. It remained part of an informal and organic learning community as opposed to a formal educational channel or tool. Later that year,

@MedEdNcl used the Twitter app Vine to create and share a set of innovative clinical skills revision resources with fellow peers gaining recognition on Twitter and other online platforms from educators both at the University and across the UK. At the time this research was conducted in 2013 there were 200 followers; this number has since grown to over 1,500 in 2015. Although there remains a social element, it has clearly become a medium for students to share and interact with educational resources, opportunities and society events.

Methods

Approaching the research from a post-positivist stance, efforts were made to minimise and control the influence of bias and error through a transparent and rigorous study design. A broadly qualitative approach to both data collection and analysis was adopted to facilitate the inductive emergence of themes. The aim required the collection of rich qualitative data to explore and make meaning of experiences for others (Kvale, 1996). Therefore, semi-structured interviews were chosen as a method of data collection followed by thematic analysis. Byrne and Long (2004) suggest interviews are well suited to explore the attitudes and beliefs of individuals.

Research aim

To gain insight into medical students' views on using Twitter educationally in order to guide effective applications within undergraduate medical education.

Following ethical approval, followers of @MedEdNcl (n=200) were targeted as the study population. With the aid of Tweet Adder software (Jung, 2013) a volunteer sampling strategy was exercised (Gall *et al.*, 2007, p 186) in which a direct message

was sent to each follower inviting them to participate in an interview. The first 6 volunteers were selected and consent obtained. This number was deemed to be appropriate for generating a sufficient amount of rich, quality data, yet remaining manageable. Participants were not discriminated against with regards to course-stage, gender, ethnicity or any other characteristic. The study sample happened to include a participant from each of the 5 stages of undergraduate medicine and 1 individual studying an intercalated degree. 5 were male and 1 female. The researcher knew 2 out of the 6 participants.

A set of open predetermined questions (Appendix 2) and others emerging naturally from the interview itself (Byrne and Long, 2004; Cohen *et al.*, 2007) focused on how and why students use Twitter. After piloting and pretesting the interview, 6 semi-structured interviews were conducted each lasting between 40-70 minutes.

Following the interviews, transcription and rereading, 109 codes were generated from the rough data. Broadly following Braun and Clarke's (2006) model, overarching descriptive labels or categories were developed and all coded material was encompassed into one of these rough labels. Then, using both the interview questions as a guide and the descriptive categories that emerged as the transcripts were read, data were grouped based on their relationships and classified into 8 themes. A second experienced qualitative researcher reviewed data analysis.

Results

Student applications of Twitter

Participants use Twitter alongside existing course teaching to consolidate their learning by revisiting key points, applying knowledge practically, working collaboratively and preparing for assessments.

"I think as a second year it's just being able to… I'm not seeing patients, but I'm getting to think about it because it's all available there for me on Twitter. I get to think about the clinical aspects of what I'm studying."

"There can be 10-20 people engaging at one time in a session. A variety of people who are perhaps qualified to medical students"

"You can share ideas with people in your own peer group, not necessarily people you know personally but people who are at the same stage of education as you or maybe slightly further along, slightly further behind."

In addition to supporting course-related learning, there is a strong sense of supplementation as users are provided with the freedom to explore personal interests and connect with new information, often in a social and collaborative manner.

"I'm interested in acute specialties, so acute medicine, ITU, anaesthesia. So there's always cases and stories being run"

"It's like a big link to the big world of the NHS outside of Newcastle med school."

"From the networking point of view, I've already created quite strong professional relationships with specialists in the field that I want to go into. So from that point of

view it's already been invaluable, it's given me a lot of tips and information about planning my career at an early stage from people who work in it."

"It's really good for keeping up to date with key information and I think that's something that you miss when you're at medical school by being taught in lectures"

Reasons behind educational application

Information on Twitter is perceived to possess a number of qualities. Participants describe the 140 character format of tweets as concise and memorable. In addition, the hyperlink function acts as gateway to online resources and media. The news feed design provides an instantly updating, accessible and passive flow of information for users. Information is seen to be personalised and reflecting popular trending topics. Ease of access via mobile devices enables immediate and ubiquitous use. Furthermore, the virtual nature of the environment provides a sense of safety. These factors combine to provide a more flexible and enjoyable learning experience for participants.

"So medical education just by virtue of it being delivered in medical schools erm is limited… it's… it can't possibly really be tailored towards you, it's tailored towards what the majority need. The addition of Twitter on top of standard medical education gives you… an extra edge that you can specifically go after the information that you want and get an accurate answer quite quickly."

"I can just type in a hashtag for a certain condition and one of my followers or one of the people I'm following might have linked to a useful website. So it's not necessarily a revision tool itself but it is a hub for all different kinds of revision tools."

"Well I tend to do it more anywhere… the fact I've got an iPhone… you can easily go on and see what's trending to quickly see if anything is worth reading."

Encouraging factors

In addition to being a reason for using Twitter, the sense of safety afforded by its virtual nature also facilitates engagement. Participants describe the effects of this in different scenarios such as interacting in large lectures and breaking down the sense of hierarchy with senior professionals. Furthermore, the social, informal and instantly updating natures of Twitter all act as facilitators. The hashtag function also makes for a more personalised and fluid learning experience.

"I'm quite shy as well I'm not one that would talk to people or go up to lecturers… Whereas on Twitter it's kind of… Because it's virtual it's not as bad."

"On Twitter, however senior someone is and however senior their job is, there isn't really that sense of hierarchy that there is face to face or in a sort of hospital environment. So you can probably have a more open relationship with people"

"It's so short that it's… One tweet is enough. I don't know how many times I've been taught GCS (Glasgow Coma Scale, a measure of the conscious state of a person) in a lecture but I'm always going to remember the way someone taught it to me on Twitter as I only had to look at 140 characters, take the whole thing in and that was it. That was the nugget of information I needed… in a lecture it might be on a slide in the middle of 40 slides that you were 20 minutes into a lecture when someone said and it took them the same number of characters but then you forgot about it straight away. Small nuggets and it's easy to digest."

Educational use is again facilitated if resources are tailored towards individual learning needs and originate from a credible source. Participants appreciate that Twitter is an open forum for interaction as it provides access to a diverse and global network of people. Finally, advantages include the immediate and captivating format of tweets along with the fact they are archived permanently for later reference.

"I would say it's reputable especially if you're following a reputable journal. I think that's the powerful thing about Twitter you've got the verified account."

"Well back to that community thing of you feel like everyone is engaging with everyone else and it's an open forum for discussion."

"The wide range of people that use it, people from all sorts of backgrounds all over the world"

Discouraging factors

The growth and evolution of Twitter has coincided with the development of a unique syntax and surrounding culture. Participants describe a lack of Twitter literacy as a barrier both to personal use and potential application by educators.

"The medical school from our point of view is generally a few steps behind where technology is going at the moment"

"Obviously everyone's (faculty) busy and they have bigger responsibilities than just responding to a Twitter feed. But erm yeah you would actually need someone to do it then and there because it's quite a live thing."

Current low usage by peers and educators is also acting as a barrier to educational use.

"the fact that it is not used by sort of the medical school yet. So I think if there were lecturers who saw the benefit of hashtagging in a lecture or said ask me questions on Twitter or, 'I'm going to go through this again in three tweets just so I've got a synopsis'. I think if there were more people within the institution who realised the benefit that would be good."

Participants describe finding it difficult to judge the credibility of information, something that tends to be a feature of learning via the internet in general. Other barriers include resources that are not tailored to individual learning needs and fear of negative repercussions arising from unprofessional conduct online. Participants identify the social element of Twitter can detract from the educational focus during learning activities and blur professional boundaries. It is felt there may be some logistical issues with the integration period, funding and maintaining the immediate and fluent nature of Twitter, which is considered so beneficial. Potential problems are also highlighted with its social and informal qualities and absence of monitoring.

"A lot of people want to sensationalise something so they get more followers and people think, 'Oh this is really interesting' but if people haven't looked at the sources of key information it can be quite dangerous."

"There's always this problem of, it's a social environment. It's not controlled by the medical school. Therefore is it the right place for interaction between lecturers and pupils?"

Qualities of student-led and University-led resources

Participants describe the characteristics of student-led resources as informal, personable, interactive and social. However, they also feel there is a propensity for error in student contributions.

"The student ones are a little less formal and more personable"

In contrast, University monitored resources are thought to possess professional, credible and reliable qualities; with a concern for the transmission of information rather than interactive activities.

"University-led ones are probably more to the point and probably more professional, again not saying students are unprofessional but it cuts out the dross that could get put on Twitter"

Potential medical school applications of Twitter

Participants suggest application would bolster academic support for students. Use by educators would aid and reinforce existing teaching, preparation for assessments and promote both interaction and collaboration amongst students. The timing of activity is considered important as are resources tailored to students at each stage of the course.

"It wouldn't need to be particularly expensive… but for example… at the end of a lecture… or lecture series they (faculty) could flag up a particular hashtag that's specifically relevant to that lecture series so students can follow a case or access the specific resources through Twitter."

"If they could encourage lecturers to post things you know exam tips or things that are important to revise, people will revise the stuff"

In addition, participants propose Twitter could be used to foster learning beyond the formal curriculum. Areas such as professional development and continuing medical education can be addressed by directing students to accounts of interesting people and credible journals, but also by encouraging exploration of areas of personal interest.

"(Educators could) use Twitter as the medium to give out some other resources, show them to wider reading"

"On Twitter I'd use 'follow Friday' to link to key people I think are interesting and if the medical school did that it could be good at encouraging students to follow people they want or think are useful. So things like the BMJ or the Medical Education Society."

More specifically, Twitter could help foster skills such as critical appraisal via discussion in journal clubs. Participants feel application can strengthen relationships between the medical school and its students by bridging the gap between teachers and students. Furthermore, it could promote a sense of community amongst students and link with societies.

"One of the things that I don't use Twitter for but a lot of people do is journal articles, access to journals, discussing journals and doing reviews. Yeah Twit Journal Club and there are lots of them… It would be really easy for the medical school to once a month say, 'Look we're going through this article' or 'Is there anything that people would like us to go through?'"

"It would improve the sense of community of the medical school, I think that's really important."

Reasons for integrating Twitter

Participants suggest connecting with students via Twitter would result in improved outcomes by creating a more personal and supportive educational experience.

"It brings together teachers and students. I think you noticed it more as you go through medical school. You know in first and second year you just see your lecturers sitting at the front of a lecture theatre. Whereas something like Twitter would… bring that bond closer, earlier, if you were tweeting lecturers... that would make the education better… when it's delivered in seminars and things where it's more personal, because you know them and you feel more comfortable to ask things that you wouldn't ask someone else you've just met."

There is an additional practical element; participants reason it makes sense to tap into an inexpensive and existing technology that has a captive audience of students.

"You've got a captive audience on Twitter of your own students and it's a platform that people engage with a lot already… You can be quite creative and inventive and it doesn't cost really very much money… So I think from the universities perspective it would be fairly easy and effective."

Future of Twitter and medical education

Growth was a salient feature. Participants believe that not only will the user base keep expanding but there will also be an increase in medical education resources, innovations and activity on Twitter. In addition, they feel there will be further integration by medical schools and linking with other social and educational technologies.

"I can see a lot of medical schools following the footsteps of places that already do run resources on Twitter."

"It's definitely going to be used more."

Discussion

Although participants follow and interact with the @MedEdNcl community, they also describe applying Twitter in a variety of other ways and formal integration by some lecturers. It is clear this range of applications combine to satisfy diverse individual learning needs. Use often acts to consolidate course-related studies but also facilitates learning beyond the formal curriculum by providing a gateway to connect with new information and explore personal interests. Furthermore, application aids professional development by enabling participants to engage with the wider medical community and keep up to date with new evidence, news and opinions. Networking and sociality are significant features; acting to foster collaboration and career planning, along with providing access to expertise and pastoral support. It appears use complements the undergraduate curriculum by involving participants in active learning processes. Existing evidence suggests this leads to enhanced engagement, deeper leaning and modification of attitudes (Chickering *et al.*, 1987; Snell, 1999; Prince, 2004), thus supporting all-round development. In addition, the instantly updating, personalised and ubiquitous nature of Twitter results in a flexible and positive educational experience. Participants largely engage in a self-directed manner, which may help develop a deeper approach to learning along with a skillset to become life-long learners and adapt to the changing needs of patients, an unequivocal expectation of a successful clinician

(Spencer and Jordan, 1999). It seems Twitter could provide opportunities for medical schools to establish a more *learner centred* approach at relatively low cost.

A number of technological and social factors influence engagement. Encouraging factors include the informal, fluent and immediate nature of communication; an accessible and passive flow of personalised and succinct information; a sense of safety afforded by its virtual nature; its design as an open forum for interaction and finally the functionality provided by searchable and archived hashtags and trends. Conversely, factors that discourage engagement include current low usage by peers, lack of Twitter literacy, fear of negative repercussions surrounding unprofessional behaviour, spam, exaggerated or sensationalised tweets and potential for information overload. In addition, the social element of Twitter can detract from educational focus and blur professional boundaries. Overall, participants appear equally receptive to both student-led and University-led resources and find both beneficial. The former are considered to be more personable, interactive and social; the latter more professional, credible and reliable.

It is important to note volunteer sampling is inherently biased as volunteers have a range of motives for taking part (Cohen *et al.*, 2007) and tend to possess certain characteristics (Gall *et al.*, 2007). It would have been preferable to randomly select a more representative sample from the study population in order to improve rigor. However, this was limited by ethical considerations surrounding the access of participants. By adopting a detached and neutral demeanour the interviewer facilitated flexible semi-structured interviews, thus participants were afforded the opportunity to disclose information largely on their terms. These measures were taken to uphold objectivity as 'freedom from bias' (Kvale and Brinkmann, 2009). The sample size of 6

was small, however it effectively facilitated exploration of the aim. Interviews provided rich and quality data and reliability and accuracy of results were addressed as data analysis was reviewed by a second experienced qualitative researcher (Armstrong *et al.*, 1997). The research context is clearly provided; its focus on a medical school setting and exploration of medical student perspectives across all stages provides novel results, which are generalisable to other medical schools.

Implications for future research

Due to the limited evidence base, it is uncertain whether further integration would result in improved outcomes and experiences for students. Consequently, it is logical to follow application with evaluation research that captures both student and faculty perceptions and provides rigorous measurement of educational outcomes. As the connection between learning theories and advancements in online technologies such as Twitter continues to diverge, additional theory-generating research is required to explicate the relationship (if any) between use and learning. This would provide a more robust theoretical basis to guide integration. Finally, fostering professional development in medical students via Twitter is an intriguing topic raised by this research and a worthy area for further exploration.

Conclusion

The 'next generation' (Sandars and Morrison, 2007) of medical students have grown up with tools such as Twitter and integrated them into their daily lives. It may be novel and distinct to teachers, but not to learners and they expect it as part of their

education. In Cook's (2009) meta-analysis, he argues the question we need to be asking about online technologies is not *if*, but *how* and *when*?

This research suggests Twitter has an array of practical applications in undergraduate medical education and provides extensive opportunities and benefits for students via *active learning* experiences. If autonomous and informal use is complemented by theoretically-based and carefully scaffold integration by medical schools, Twitter can effectively foster personal and professional development. Not only to satisfy traditional learning objectives but also transcend the confines of the formal curriculum and target *individual* learning needs. However, finding a balance between institutional or staff involvement is essential. Students value faculty involvement for credibility, but only to a certain threshold. As the body of evidence grows it is increasingly difficult to ignore Twitter, not only as a viable option, but as a powerful medium for medical education. Medical schools must harness this technology and procure the benefits for their students to enhance learning, connect with the real world and develop the skillset required to practice effectively in this digitally connected 21st century.

Focusing on the future, this research presents an innovative and low cost solution to our persisting reliance on a dated and impersonal transmission-based model of learning. In order to truly modernise undergraduate medicine we must recognise its pedagogical limitations and strive for a more constructivist, sociocultural and metacognitive approach. Thus cultivating an optimum organic, learner centred and supportive educational environment for students.

Recommendations

1. Scaffold autonomous and informal educational use of Twitter amongst students by providing a Twitter tutorial at the beginning of the course to communicate the potential uses and benefits of application throughout medical school and how to maintain professionalism on social media.

2. Train educators in the use of Twitter to improve literacy and increase awareness of the potential educational applications, benefits and problems.

3. Better leverage medical school Twitter accounts to disseminate educationally relevant information, resources and accounts to students in a timely and tailored manner in order to spark interest, support their learning and link to wider reading.

4. Promote interaction and collaboration outside of the classroom, or if appropriate, during teaching by employing a series of unique, stage-specific and module-specific hashtags in order to guide discussion amongst peers and between students and educators (if they wish to take part).

5. In general, faculty engagement on Twitter is essential to maximise educational benefits for students and increase credibility of resources. However, medical schools should minimise using a Twitter account to interact with students on a more social level as evidence suggests this may detract from its professional focus and reduce educational value.

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Appendix 1: A dictionary of common Twitter terminology

Phrase	Meaning
@username	*The @ symbol is used in combination with a Twitter username in order to address a communication to someone.*
direct message (DM)	*A function that allows users to send private direct messages to people who they follow. These can be up to 140 characters and have their own separate mailbox.*
follower/following	*A follower is someone who subscribes to receive your posts. Similarly, 'following' someone means you will see his or her tweets in your own personal timeline.*
hashtag (#)	*A hashtag is a way of organising your updates for Twitter search engines. Users prefix a message with a community-driven hashtag to enable others to discover relevant posts. For example #MedEd or #FOAMed (Free Open Access Medical Education).*
microblog	*A type of blog that enables users to post short text updates. There are a number of services for this including instant messaging, email and Twitter.*
retweet (RT)	*Abbreviated as RT, retweets show the post contains something that was previously posted by another user.*
tweet	*The name for all posts on Twitter, tweets consist of a written communication of up to 140 characters. They may contain free text in combination with one or more functions: @username, hashtag, hyperlink or embedded media.*
Twitter	*Online real-time network and microblogging service. Easily accessed on any internet capable device or via a mobile app. Available at* https://twitter.com/.

Appendix 2: Semi-Structured Interview Guide

Section 1 – How and why medical students are using Twitter

How long have you been on Twitter?

Could you please describe to me the different ways in which you use Twitter?

How do you use Twitter for medical education purposes?

What do you get out of using Twitter educationally?

When do you tend to use Twitter in an educational capacity?

Section 2 – Factors influencing engagement

Which factors encourage you to engage in using Twitter for medical education purposes?

Which factors discourage you from engaging with Twitter for medical education purposes?

Twitter resources are commonly student-led at the moment. Do you think if the University ran these you would still use them?

Section 3 – Educational applications of Twitter by medical schools

Do you feel the medical school could apply Twitter effectively for educational purposes?

What do you think is going to happen in the future?

Section 4 – Rounding off

Is there anything else you want to say about this topic, that I haven't asked you?

Appendix 3: Definitions

'Social' – pertaining to friendly companionship or relations between people, the nature of which is not necessarily related to medical education.

'Social interaction' - reciprocal actions and communications between people for social purpose.

'Informal use' – characterised by casual and unplanned nature.