

## Twitter: An effective learning tool within medical education

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### Abstract

Educational social media platforms such as dedicated Facebook pages and Twitter hashtags are increasingly being used by anatomy educators as learning support tools with positive outcomes such as: increasing student engagement with the subject of anatomy, facilitating communication with educators and reducing student anxiety levels in the lead up to assessments by offering learning support information. There have been less reports on whether these platforms impact on student's anatomy knowledge. One previous investigation demonstrated that the frequency of student engagement with a dedicated Twitter hashtag did not increase their exam scores, however the methodology did not provide specific learning feedback opportunities to students. Since then, Twitter introduced a polling tool. This project investigated whether the polling tool could effectively be used to deliver regular MCQ style questions (followed by feedback) to students and whether student's use of this tool had an effect on exam scores. Second year medical students enrolled on the Musculoskeletal and Immunity Module 2015 (n=140) at Brighton Sussex Medical School were offered the #m204anatomy Twitter hashtag as a learning support tool which included weekly Twitter polls questioning student's anatomy knowledge. Students were invited to complete a questionnaire asking whether they had answered Twitter polls and for consent to use their exam scores to compare against their use of the polls. Student opinions on the hashtag were also obtained during a focus group with five students. Ninety-three students successfully completed the questionnaire and gave consent. 62% of students didn't use the Twitter polls and their mean anatomy exam score was 59.7%. 38% of students did answer the Twitter polls and their mean exam score was 67.2%, which showed to be significantly higher ( $p = 0.012$ ) than those who did not use the Twitter polling tool. This indicates that the Twitter polling tool can be used as a formative assessment tool to enhance student anatomy knowledge. However, the majority of students are reluctant to engage with educational social media platforms and findings from this study indicate this is due to a fear that students will be identified as lacking knowledge and breaching professionalism guidelines.

**Keywords:** Social media, Twitter, Medical education, Professionalism, Learning experience

### Introduction

Social media has become ubiquitous in today's society and for the majority of current students within higher education, using social media to acquire information and communicate with colleagues comes as second nature. Today's generation of "Millennial students" (meaning those who were born close to the turn of the millennium) are said to display aptitudes, attitudes, expectations and learning styles correlating to their digitally enriched upbringings (Roberts, 2005; DiLullo et al, 2011). Although Jones & Shao 2011 argue that these "Digital Natives" now entering Higher Education do not demand or expect vast changes in pedagogical approaches, who describe that the obvious changes taking place in student bodies is their use of social networking sites to access multimedia and their use of handheld devices to access mobile internet. This is supported by Hall et al (2013); Foley et al (2014) who found that today's students are incorporating social media and online digital resources, particularly YouTube® (YouTube, San Bruno, CA) (Jaffar, 2012; Mukhopadhyay et al, 2014) into their learning, to source and share information (Barry et al, 2016). Professionals within Higher Education have responded to this trend by incorporating social media platforms into their teaching practice and have reported positive outcomes for students including online discussion opportunities, sharing resources, assessment preparation and study organization (Wang, 2013; Donlan, 2014; Albayrak and Yildirim, 2015; Ali, 2016).

Within medical education, social media has been advocated (Kind et al, 2014; Choo et al, 2015; Roy et al, 2016) as a modern means for educators to communicate and engage with their learners, since it was reported to enable members of faculty to provide feedback to learners and increase learner satisfaction (Cheston et al,

2013). An increasing number of examples of how it has been utilized by other medical educators are being documented (Chtouki et al, 2012; Jaffar, 2012; George et al, 2013; Hortsch, 2013; Raikos and Waidyasekara, 2014; Gonzalez and Gadbury-Amyot, 2016; Jaffar and Eladl, 2016; Lugo-Fagundo et al, 2016). Bergl & Muntz, 2016 have proposed furthering the use of social media into the later clinical training years of medicine since it provides a convenient platform for sharing knowledge, reflective writing, shared problem solving and peer teaching amongst busy contemporary clinician-educators and learners alike.

More specifically within medical education anatomical educators have already been increasing their efforts to engage with their students using social media by setting up dedicated Facebook® (Facebook, Menlo Park, CA) education pages (Jaffar, 2014, Pickering and Bickerdike 2016) as well as module specific Twitter® (Twitter, San Francisco, CA) accounts and hashtags (Gunn et al, 2016; Hennessy et al, 2016), all of which reported that students are keen to engage with social media for support with their learning. These studies revealed further positive outcomes from the use of such social media platforms including; increasing student engagement with course material, increasing motivation to learn, facilitating communication with educators, creating a support network amongst the student cohort and reducing student anxiety levels in the lead up to assessments by offering learning support information.

However, the introduction of academic social platforms does not come without conflict with and in particular for medical students, any inappropriate use of social media such as breaking patient confidentiality or sharing offensive information is a breach of the professionalism guidelines provided by the General Medical Council (GMC, 2013), since there have been reports where students have received warnings and even suspended from their course following unprofessional behavior on social media (Chretien et al, 2009). Nonetheless, the literature suggests that the positive effects of using educational social media platforms outweighs any potential negative outcomes (Al Wahab et al, 2016) and they can provide a benefit to medical students (Ali, 2016; Cartledge et al, 2013; Hennessy et al, 2016; Jaffar and Eladl, 2016; Pickering and Bickerdike, 2016). It can be argued that as long as anatomy educators acknowledge and respect these potential challenges (Peluchette and Karl, 2008; Chretien et al, 2009; Marnocha et al, 2015), introducing social media platforms may provide crucial early professional development for medical students who face a society where using social media to communicate and exchange knowledge is the reality (Bergl & Muntz, 2016; Hennessy, 2016; Choo et al, 2015).

Despite the increased adoption and reported positive outcomes from educational social media platforms there have been relatively few evaluations to assess whether these platforms impact on student's learning and knowledge which needs to be addressed (Roy et al, 2016; Pickering and Joynes, 2016). It has only been suggested that the level of student engagement with educational Facebook pages can be correlated to academic achievement (Jaffar, 2014; Jaffar and Eladl, 2016). However, work by Hennessy et al (2016) demonstrated that the frequency of student engagement with a dedicated Twitter hashtag did not increase exam scores. The stated study noted one major limiting factor within the methodology being that there was a lack of specific learning tasks and feedback opportunities for students to access while using the hashtag. Since then, Twitter has introduced a polling tool option which it is thought may a formative assessment opportunity (in a multiple choice question style), for students to assess and assist their learning by voting on and receiving feedback on their voting choice. To the author's knowledge there have no previous reports in the literature of using the Twitter polling tool for such purposes, therefore the present study aimed to initiate investigations into whether the polling tool can enhance the usefulness of educational Twitter hashtags by providing formative assessment opportunities and whether engaging with these has an impact on student knowledge levels.

The aims of this project were to investigate using a mixed methods approach:

1. if and how medical students at Brighton Sussex Medical School (BSMS) make use of a dedicated Twitter hashtag to support their anatomy learning
2. whether the Twitter polling tool can effectively be used at BSMS to deliver regular MCQ style questions (followed by feedback) and whether student use of this tool had an effect on exam scores
3. the potential challenges associated with introducing educational social media platforms to medical students

## Methods

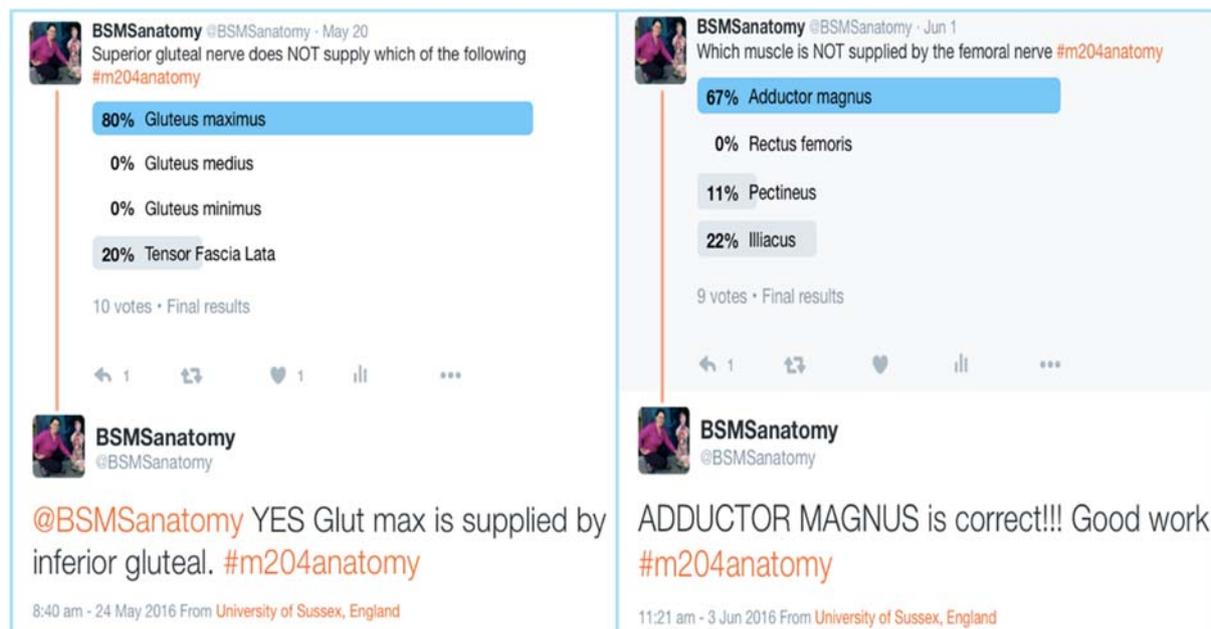
### Context of this Study

This study was conducted within the Division of Medical Education (Anatomy department) at Brighton and Sussex Medical School (BSMS) where a dedicated Twitter hashtag was used by an anatomy educator (author) to support a cohort of medical students with their learning during a specific anatomy course. This study adopted a mixed methods approach and was intended to create a start point for investigating the uses and challenges of using Twitter in medical education, for future research. It was approved by the Research Governance and Ethics Committee Ref No: 16/001/HEN.

### Development of the anatomy module hashtag, study context and participants

A hashtag (#m204anatomy) was created and launched by a faculty member (author, CH) at the beginning of term to all second year medical students (n=140) enrolled on the anatomy course of the Musculoskeletal and Immunity Module 2015 at BSMS. Students were encouraged to set up a Twitter account to be able to fully participate in hashtag activities however no specific instructions on how to use the hashtag were given. Students were informed that it was an optional learning support tool which they could use for such things like communicating with faculty and peers or sharing learning ideas and recourses. Students were reminded that they should maintain their professionalism when using the hashtag but otherwise they were free to use the hashtag as they preferred. For inclusivity purposes, a widget which displayed the hashtag feed was set up on the school's virtual learning environment Student Central, where all hashtag contributions could be viewed (only). It was highlighted to students that faculty members would be monitoring the hashtag regularly in an effort to support learning and in particular that weekly Twitter polls would be tweeted by faculty which would be testing student's anatomy knowledge from anatomy content taught that week. Students were informed that it was not compulsory to vote on the polls and they could only do so if they had a Twitter account.

During the ten weeks of term-time, a faculty member (CH) monitored the hashtag daily and tweeted regular Twitter polls. The poll was left open for voting for 48 hours after which time the correct answer/voting option was subsequently tweeted by faculty (author, CH) offering feedback to students (see Figure 1). Other non-scheduled learning ideas and resources were tweeted by faculty when and where appropriate, as well as any responses to student queries.



**Figure 1:** Examples of the Twitter polls offered to students using #m204anatomy.

## Post-module analysis of hashtag use

At the end of the module analysis of how the hashtag was used was completed using a sequential explanatory mixed methods design (Creswell and Plano Clark, 2007) of quantitative (questionnaire) followed by qualitative (focus group) data collection. A mixed methods approach was used so that questionnaire responses could be confirmed and developed using deeper questioning during the focus group (O’Cathain, 2010).

### *Questionnaire*

All students were invited to voluntarily complete a written questionnaire asking for their feedback on whether they had been answering the polls throughout the module or not. The questionnaire was also used to ask students for consent to use their examination scores from the anatomy components of their end of term summative assessment (Knowledge Test), for comparison against their use of the polls. The mean anatomy exam score of students who did answer the polls was compared to the mean exam score of students who did not answer the polls. The mean exam scores of both groups of students were compared using an Independent samples T-test ( $p < 0.05$ ).

Students were also asked on the questionnaire to express interest in participating in a focus group to share further detailed feedback on the usefulness of the Twitter hashtag for their learning.

### *Focus group*

A single, two-hour focus group was conducted with five volunteering students, who were chosen using a convenience sampling procedure as follows: all volunteering students were emailed if they had expressed interest in attending the focus group; and any students who confirmed their attendance were chosen. The primary investigator facilitated the session and asked a series of open questions designed to encourage students to share deeper views and build on the questionnaire findings regarding how the hashtag impacted upon their learning experience. The session was audio recorded and transcribed. The document analysis technique was used to perform line by line coding (Charmaz, 2003) of the student responses to code for commonalities within responses (Creswell, 2012; Schreier, 2012). A number of common themes were identified, compared and collapsed into three broad categories (Burnard, 1991).

## **Results**

### Questionnaire responses

Ninety-three students successfully completed the questionnaire and gave consent to use their exam scores for comparison against their use of the polls (66% response rate). Of these students 62% reported to not answer the polls and their mean anatomy exam score was 59.7%. 38% of students did answer the Twitter polls and their mean exam score was 67.2%, which showed to be significantly higher ( $p = 0.012$ ) than those who did not use the Twitter polling tool.

### Focus group findings

Three main categories were identified from the focus group responses regarding how the #m204anatomy hashtag impacted the student’s learning experience. These categories are detailed below and evidenced with supporting student quotes.

#### **1. Twitter polls were a valued learning resource for formative assessment**

*Student 1 shared that the hashtag: “was a really positive..adjunct to my learning.....an opportunity to test yourself....there was a question [poll]....which collateral ligament would be damaged in an injury and of course you go over the collateral ligaments in the knee again”.*

Student 4 added: "I really liked the questions....I learn best by questioning myself rather than just reading bits of information. I found those really useful".

Student 1 agreed by saying: "the questions are the main advantage, they....help me learn".

Student 4 expanded on this point: "with the questions [polls] you actually have to think about it cause you're actually doing something".

## **2. Medical students are fearful of exposing a lack of knowledge on dedicated educational Twitter hashtags**

Student 2 explained: "I think you'd be surprised at how many people look at it [the hashtag] rather than post....a lot of our year have looked at it but are just not confident enough.....I'm like oh I think that's the answer and then I'll wait to see the answer come up just to make sure I'm right, but we're looking".

Student 3 agreed with this and Student 4 added that: "the whole process of getting into medical school, going through it and everything is a massive competition so you don't want to be seen to be stupid or an idiot or whatever like you don't know something. We've all got this inherent fear of sticking our neck on the line for the fear that you'll just end up coming out worse than you would otherwise.....because you don't wanna seem stupid because you're supposed to be...a young professional, soon-to-be doctor".

Student 5 expanded on this point that: "maybe not now but in my later years I might be more concerned with how I'm being viewed because obviously it is in the public domain and if I'm asking quite a simple question, well it's not simple to me cause I don't understand it but others..[might think]..he's a fifth year student....[or].... he's going to be a doctor in six months and he doesn't even know what branch of the brachial plexus that's from".

## **3. Medical students receive a very negative message about social media from curriculum leaders and are extremely conscious of breaching any rules of professionalism.**

Student 5 recalled being warned during the first week of medical school as follows: "your social media account....we're not monitoring it but if you say something or do something strange or criminal, it's going to come back and bite you....nothing is invisible."

Student 1 shared that: "since joining med school I've.....adapted my Facebook profile to be... nothing rude but still a bit of my social life....I'll usually un-tag myself just so there is no association between me and that kind of lifestyle {being drunk on nights out}".

Student 5 agreed with this and added that "there is definitely a fear" and a belief amongst medical students that the "GMC (General Medical Council) are everywhere".

Student 4 explained that there is a "fear, like you need to be this proper professional law abiding citizen and of course you do...but there's just this like extra fear that you need to be even more on top of it because we're doing medicine".

## **Discussion**

The motivation behind this study was to investigate BSMS student usage and their opinions on using a Twitter hashtag where regular Twitter polls were tweeted by faculty to support anatomy learning by providing a proposed method of formative assessment and whether individual student usage impacted on their exam scores.

The quantitative data revealed that 38% of students used the Twitter hashtag and answered the weekly polls during the anatomy course. The results show that although the majority of students (62%) chose not to answer the weekly polls, the students who did answer the weekly polls displayed significantly greater anatomy knowledge scoring a mean exam score of 67.2% compared to the mean score of 59.7% for students who did not answer the polls. This is in contrast to a previous study (Hennessy et al, 2016) where it was found that engagement levels with a similar educational hashtag had no effect on exam scores, potentially because no method of formative assessment was delivered. Although all educational social media platforms Bandura's Social Learning Theory (1971) as a means of facilitating learning, in the present study it is thought that the polls, acting as formative assessment tools, use Vygotsky's (1978) zone of proximal development theory to allow

students to confirm and then move their learning forward (Shepard, 2005) resulting in increased knowledge and exam scores. The increased exam scores as well as the qualitative focus group data (category 1) received during the present study strongly indicate that educational social media platforms are valuable optional learning resources for students.

The percentage student use of the weekly polls (38%), as gathered from the questionnaire, was thought to be quite low, therefore subsequently, the focus group was used to gain insight into any potential barriers medical students experience when using such educational social media platforms and social media generally. One finding that emerged during the focus group was that medical students are fearful of being identified for having gaps in their knowledge, to the greater social media world. This might go some way to explaining why a majority of the students chose not to answer the Twitter polls, despite the fact that voting is anonymous. This trend does follow previous reports where a majority of students decided not to make contributions but to simply view educational social media platforms (Hennessy et al, 2016; Pickering and Bickerdike, 2016). The key message emerging from category 2 of the focus group is that students are reluctant to engage because they are fearful of “looking stupid”, which is supported by Pickering and Bickerdike (2016) who also found that males are significantly less likely to ask a question on social media platforms in case they are perceived to lack knowledge. These findings are concerning since as medical students progress through their careers, they should feel confident to engage in discussions with their peers and seniors, admitting when they do not know something so that they can gain knowledge from others.

Considering the focus group message revealed in category 3, it is reasonable to suggest that this fear expressed by medical students, exposing a lack of knowledge, is heightened when using social media platforms. It emerged that medical students receive a very negative message about social media from curriculum leaders, who quite rightly, warn students about the consequences of unprofessional social media use. Students suddenly experience the idea of a “Context Collapse” where their social media use is no longer associated with just personal use but brings together commonly distinct audiences (Marwick and Boyd, 2010), from peer medical students and professionals to academics and governing bodies. This context collapse may explain the findings of this study since it can result in self-censorship, where individuals are aware their most sensitive audience members and want to convey intelligence and professionalism (Marwick and Boyd, 2010) even if it means limiting discourse on social media. This is disappointing since social media, for the majority of students, would previously have been a useful means of sourcing information, then suddenly it becomes a threat to their professional profile, if used inappropriately. There is an uncertainty around how to maintain one’s professionalism while communicating on such platforms (Hennessy, 2016) despite the fact that guidelines have been provided by governing bodies (GMC, 2013). This seems to have led to a confusion on how best to instruct early year medical students on appropriate use of social media and instead scaremongering them from contributing to any education or professional platforms.

The main limitation of this small mixed methods study is that it has limited generalizability since the findings represent only one cohort of medical students in one university however these findings support those of Langenfeld et al, (2016), that there is a need for more standardized policies to educate medical students on maintaining a professional social media profile, it is proposed that this study creates a start point for future academic research on a larger scale.

## **Conclusion**

This study indicates that the Twitter polling tool can be used as a formative assessment tool for students to enhance their anatomy knowledge. However, medical students are reluctant to fully immerse themselves and make contributions to educational social media platforms which might expose their identity and any gaps in their knowledge. Furthermore, medical students feel that their behavior and professional identity on such sites is being watched and judged by governing bodies is under greater scrutiny should they partake in additional social media activity, even though there is a lack of clarity on how to measure such unprofessional behavior (Langenfeld et al, 2014; Walton et al, 2015). The reality is that social media is a method of communication which is in accession and medical students cannot be expected to develop good judgement of its use if they are being deterred away from using it by program leaders, however more standardized guidance on how it can be used is required.

## References

- Al Wahab, A., Al-Hajo, S., AlAhmdani, G., Al-Mazroua, N., Edan, M., Nugud, S. and Jaffar, A. (2016) "The Patterns of Usage and Perceived Impact of Social Networking Sites on Medical Students' Education", *J Nur Healthcare*, Vol 1, No.2, pp 1-4.
- Albayrak, D. and Yildirim, Z. (2015) "Using social networking sites for teaching and learning: Students' involvement in and acceptance of Facebook as a course management system", *J Educ Comput Res*, Vol 52, pp 155–179.
- Bandura, A. (1971) *Social Learning Theory*, 1st Ed. Prentice-Hall, Englewood Cliffs, New York.
- Barry, D.S., Marzouk, F., Chulak-Oglu, K., Bennett, D., Tierney, P. and O'Keeffe, G.W. (2016) "Anatomy education for the YouTube generation", *Anatomical Sciences Education*, Vol 9, pp 90–96.
- Bergl, P. and Muntz, M. (2016) "Using social media to enhance health professional education", *Clinical Teacher*, Vol 13, pp 399–404.
- Burnard, P. (1991) "A method of analysing interview transcripts in qualitative research", *Nurse Educ Today*, Vol 11, pp 461–466.
- Cartledge, P., Miller, M. and Phillips, B. (2013) "The use of social-networking sites in medical education", *Medical Teacher*, Vol 35, pp 847–857.
- Charmaz, K. (2003) *Grounded theory. In: Smith JA. Qualitative Psychology: A Practical Guide to Research Methods*, 1<sup>st</sup> Ed, SAGE Publications Ltd., London.
- Cheston, C.C., Flickinger, T.E. and Chisolm, M.S. (2013) "Social media use in medical education: A systematic review", *Acad Med*, Vol 88, pp 893–901.
- Choo, E.K., Ranney, M.L., Chan, T.M., Trueger, N.S., Walsh, A.E., Tegtmeyer, K., McNamara, S.O., Choi, R.Y. and Carroll, C.L. (2015) "Twitter as a tool for communication and knowledge exchange in academic medicine: A guide for skeptics and novices" *Medical Teacher*, Vol 37, pp 411–416.
- Chretien, K.C., Greysen, S.R., Chretien, J.P. and Kind, T. (2009) "Online posting of unprofessional content by medical students", *JAMA*, Vol 302, pp 1309–1315.
- Chtouki, Y., Harroud, H., Khalidi, M. and Bennani, S. (2012) "The impact of YouTube videos on the student's learning" In: *Proceeding of the International Conference on Information Technology Based Higher Education and Training (ITHET 2012)*; Istanbul, Turkey, 2012 June 21-23. pp 1–6. Institute of Electrical and Electronics Engineers, Piscataway, New Jersey.
- Creswell, J.W. (2012) *Qualitative Inquiry and Research Design: Choosing Among Five Approaches*, 3<sup>rd</sup> Ed., SAGE Publications Inc. Thousand Oaks, California.
- Creswell, J.W. and Plano-Clark, V. (2007) *Designing and Conducting Mixed Methods Research*, SAGE Publications Inc. Thousand Oaks, California.
- DiLullo, C., McGee, P. and Kriebel, R.M. (2011) "Demystifying the millennial student: A reassessment in measures of character and engagement in professional education", *Anatomical Sciences Education*, Vol 4, pp 214–226.
- Donlan, L. (2014) "Exploring the views of students on the use of Facebook in university teaching and learning", *J Further High Educ*, Vol 38, pp 572–588.

- Foley, N.M., Maher, B.M. and Corrigan, M.A. (2014) "Social media and tomorrow's medical students—How do they fit?", *J Surg Educ*, Vol 71, pp 385–390.
- George, D.R., Dreibelbis, T.D. and Aumiller, B. (2013) "How we used two social media tools to enhance aspects of active learning during lectures", *Medical Teacher*, Vol 35, pp 985–988.
- GMC. (2013) General Medical Council, *Doctors' Use of Social Media (2013)*. General Medical Council, London, UK., [online], [http://www.gmc-uk.org/guidance/ethical\\_guidance/21186.asp](http://www.gmc-uk.org/guidance/ethical_guidance/21186.asp).
- Gonzalez, S.M. and Gadbury-Amyot, C.C. (2016) "Using Twitter for teaching and learning in an oral and maxillofacial radiology course", *J Dental Educ*, Vol 80, pp 149–155.
- Gunn, E.G.M., Cundell, D., Duffy, S., Thomson, N., Patel, S. and Allsop, S.A. (2016) "Anatomy in 140 characters or less: Developing @Bristoldemos, a social media-based additional learning resource". In: *Abstracts of Anatomical Society and British Association of Clinical Anatomists 2016 Summer Meeting*, Brighton, UK, 2016. Abstract 19. The Anatomical Society, London, UK.
- Hall, M., Hanna, L.A. and Huey, G. (2013) "Use and views on social networking sites of pharmacy students in the United Kingdom", *Am J Pharm Educ*, Vol 77, p 9.
- Hennessy, C.M. (2016) "Lifting the negative cloud of social media use within medical education", *Anatomical Sciences Education*, Vol 10, pp 98-99.
- Hennessy, C.M., Kirkpatrick, E., Smith, C.F. and Border, S. (2016) "Social Media and Anatomy Education: Using Twitter to enhance the student learning experience in anatomy", *Anatomical Sciences Education*, Vol 9, pp 505–515.
- Hortsch, M. (2013) "Virtual biology: Teaching histology in the age of facebook", *FASEB J*, Vol 27, pp 411–413.
- Jaffar, A.A. and Eladl, M.A. (2016) "Engagement patterns of high and low academic performers on facebook anatomy pages", *J Med Educ Curric Dev*, Vol 3, pp 1–8.
- Jaffar, A.A. (2012) "YouTube: An emerging tool in anatomy education", *Anatomical Sciences Education*, Vol 5, pp 158–164.
- Jaffar, A.A. (2014) "Exploring the use of a Facebook page in anatomy education", *Anatomical Sciences Education*, Vol 7, pp 199–208.
- Jones, C. and Shao, B. (2011) "The Net Generation and Digital Natives: Implications for Higher Education. Higher Education Academy, UK, [online], <https://www.heacademy.ac.uk/system/files/next-generation-and-digital-natives.pdf>
- Kind, T., Patel, P.D., Lie, D. and Chretien, K.C. (2014) "Twelve tips for using social media as a medical educator", *Medical Teacher*, Vol 36, pp 284–290.
- Langenfeld, S.J., Cook, G., Sudbeck, C., Luers, T. and Schenarts, P.J. (2014) "An assessment of unprofessional behavior among surgical residents on Facebook: A warning of the dangers of social media", *J Surg Educ*, Vol 71, pp 28–32.
- Langenfeld, S.J., Vargo, D.J. and Schenarts, P.J. (2016) "Balancing privacy and professionalism: A survey of general surgery program directors on social media and surgical education", *J Surg Educ*, Vol 73, pp 28-32.

Lugo-Fagundo, C., Johnson, M.B., Thomas, R.B., Johnson, P.T. and Fishman, E.K. (2016) "New frontiers in education: Facebook as a vehicle for medical information delivery", *J Am Coll Radiol*, Vol 13, pp 316–319.

Marnocha, S., Marnocha, M.R. and Pilliow, T. (2015) "Unprofessional content posted online among nursing students", *Nurse Educ*, Vol 40, pp 119–123.

Marwick, A.E. and Boyd, D. (2011) "I tweet honestly, I tweet passionately: Twitter users, context collapse, and the imagined audience", *New Media and Society*, Vol 13, pp 114-133.

Mukhopadhyay, S., Kruger, E. and Tennant, M. (2014) "YouTube: A new way of supplementing traditional methods in dental education", *J Dent Educ*, Vol 78, pp 1568–1571.

O’Cathain, A. (2010) *Mixed methods involving qualitative research. The Sage Handbook of Qualitative Methods in Health Research*, pp 575-588. [online], <http://sk.sagepub.com/reference/download/sage-hdbk-qualitative-methods-in-health-research/n30.pdf>.

Peluchette, J. and Karl, K. (2008) "Social networking profiles: An examination of student attitudes regarding use and appropriateness of content", *Cyberpsychol Behav*, Vol 11, pp 95–97.

Pickering, J.D. and Bickerdike, S.R. (2016) "Medical student use of Facebook to support preparation for anatomy assessments", *Anatomical Sciences Education*, In press: doi:10.1002/ase.1663.

Pickering, J.D. and Joynes, V.C. (2016) "A holistic model for evaluating the impact of individual technology-enhanced learning resources", *Medical Teacher*, Vol 38, pp 1242-1247.

Raikos, A. and Waidyasekara, P. (2014) "How useful is YouTube in learning heart anatomy?", *Anatomical Sciences Education*, Vol 7, pp 12–18.

Roberts, G.R. (2005) "Technology and learning expectations of the net generation" In: Oblinger D, Oblinger J (Editors). 2005. *Educating the Net Generation*. 1st Ed. Boulder, CO: Educause, p 3.1–3.7.

Roy, D., Taylor, J., Cheston, C.C., Flickinger, T.E. and Chisolm, M.S. (2016) "Social media: Portrait of an emerging tool in medical education", *Acad Psychiatry*, Vol 40, pp 136– 140.

Schreier, M. (2012) *Qualitative Content Analysis in Practice*, 1<sup>st</sup> Ed. SAGE Publications Inc. Thousand Oaks, California.

Shepard, L.A. (2005) "Assessment to Promote Learning: Linking Formative Assessment to Scaffolding", *Educational Leadership*, Vol 63, pp 66-70.

Vygotsky, L.S. (1978) *Mind in Society: The Development of Higher Psychological Processes*, 14th Ed. Harvard University Press, Cambridge, USA.

Walton, J.M., White, J. and Ross, S. (2015) "What's on your Facebook profile? Evaluation of an educational intervention to promote appropriate use of privacy settings by medical students on social networking sites", *Med Educ Online*, Vol 20, p 28708.

Wang, J. (2013) "What higher educational professionals need to know about today's students: Online social networks", *Turkish Online J Educ Tech*, Vol 12, pp 180–193.