Computers in Human Behavior 29 (2013) A69–A81

Contents lists available at SciVerse ScienceDirect

Computers in Human Behavior

journal homepage: www.elsevier.com/locate/comphumbeh

# Social media and the introductory statistics course

Michelle Everson [a,*], Ellen Gundlach [b,1], Jacqueline Miller [c,2]

[a] Department of Educational Psychology, University of Minnesota, 250 Education Sciences Building, 56 East River Road, Minneapolis, MN 55455, United States
[b] Department of Statistics, Purdue University, 250 N. University Street, West Lafayette, IN 47907-2066, United States
[c] Department of Statistics, The Ohio State University, 1958 Neil Avenue, 404 Cockins Hall, Columbus, OH 43210-1247, United States

ARTICLE INFO

*Article history:*
Available online 22 January 2013

*Keywords:*
Social media
Teaching
Technology
Facebook
Twitter
YouTube

ABSTRACT

The popularity of social networking sites such as Facebook, Twitter, and YouTube begs the question of how such sites might be used for educational purposes within classroom settings. This paper presents a review of some of the educational uses of Facebook, Twitter, and YouTube within college classrooms. Because of the lack of published reports on the use of social media within statistics classrooms, the authors share their own examples of how social media can be used within the introductory statistics classroom, and they outline recommendations and considerations for other instructors who might want to explore the use of social media in their own courses.



## 1. Introduction

"Being literate no longer only involves being able to read and write. The literate of the twenty-first century must be able to download, upload, rip, burn, chat, save, blog, Skype, IM, and share" (Mullen & Wedwick, 2008, p. 66).

There is no escaping the fact that we now live in a world where people have opportunities to connect, communicate, and collaborate in ways that were once inconceivable. Just within the last decade, there has been an epic shift in terms of how individuals use the Internet. Whereas the Internet was once a place for individuals to simply read and obtain information, there are now opportunities for individuals to participate in online activities, collaborate with others, and take part in creating and disseminating their own work. We refer to "Web 2.0" as a way to differentiate the current state of the Internet—where individuals can play a more active role in creating and modifying information and can collaborate with others about this information—from the original (or "Web 1.0") state where information was often controlled by a smaller number of individuals and meant to be more passively received by users (Greenhow, Robelia, & Hughes, 2009; Kaplan & Haenlein, 2010).

According to Greenhow et al. (2009):

> "Web 2.0 includes social networks, such as MySpace, Facebook, and Ning; media sharing, such as YouTube and Flickr; social bookmarking, such as Delicious and CiteULik; collaborative knowledge development through wikis (e.g., Wikipedia); creative works, such as podcasts, videocasts, blogs, and microblogs (e.g., Twitter, Blogger); content aggregation and organization, such as RSS (Really Simple Syndication) feeds and tagging tools; and remixing or mash-ups of content from different content providers into new forms, such as combining geographical data with transportation or crime data" (p. 247).

Many of these technologies are referred to as "social media" in that they allow for both the creation and exchange of user generated content (Kaplan & Haenlein, 2010). It is the ability to exchange ideas within this new media that makes both the process and product socially constructed.

Social media sites are defined by Boyd and Ellison (2008) as "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (p. 211). When you consider the number of individuals who use social media sites, the importance of these sites becomes clearer. Ferriter (2010) reported that 61% of adults who regularly go online interact with one another on social media sites, and 73% of teens who regularly go online interact with their peers using social media sites.

Included among the social media sites mentioned by Boyd and Ellison are Facebook, Twitter, and YouTube, none of which existed before 2004. Interestingly, although social media now allow students to communicate with each other and with their instructors from a variety of locations, from a variety of different platforms, and in a variety of different ways, very little research exists specifically about the use of social media sites for educational purposes

* Corresponding author. Tel.: +1 612 624 0691.
*E-mail addresses:* gaddy001@umn.edu (M. Everson), gundlach@purdue.edu (E. Gundlach), miller.203@osu.edu (J. Miller).
[1] Tel.: +1 765 496 6875.
[2] Tel.: +1 614 688 4546.

0747-5632/$ - see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.chb.2012.12.033

(Greenhow, 2011), despite the observation that many of these technologies are used frequently by college students (Junco & Cole-Avent, 2008). According to Greenhow et al. (2009), students tend to use certain Web 2.0 technologies in everyday life, and some feel they would benefit from more inclusion of such technologies in the classroom. Is it possible to motivate and engage these "neomillenial" students by finding new ways to incorporate social media into the classroom? Given that today's college freshmen have never experienced a life without the Internet and have been dubbed the "Internet class" on the 2011 Beloit College Mind-Set List (Troop, 2011), it seems paramount that we focus on ways in which we as educators can most effectively teach these students.

The Millennials, also known as the Net Generation or Generation Y, were born in the 1980s or early 1990s (Baird & Fisher, 2005–2006; Barnes, Marateo, & Ferris, 2007). Students of this generation like to multitask, want to know how what they are learning applies to the "real world," and prefer to work in a flexible classroom where their individuality is respected and they receive plenty of feedback (Westerman, 2006–2007). While the term "millennial" is used to describe a particular age group, the neomillenial learning style spans other generations as well. Dede (2005) explains that the neomillenial learning style uses "mediated immersion" in "distributed learning communities" including:

1. Fluency in multiple media, valuing each for the types of communication, activities, experiences, and expressions it empowers.
2. Learning based on collectively seeking, sieving, and synthesizing experiences rather than individually locating and absorbing information from a single best source.
3. Active learning based on both real and simulated experiences that includes frequent opportunity for reflection.
4. Expression through non-linear, associational webs of representations rather than linear "stories" (e.g., authoring a simulation and a webpage to express understanding, rather than a paper).
5. Co-design of learning experiences personalized to individual needs and preferences (p. 25).

While there are benefits to accommodating the neomillenial learning style, Barnes et al. (2007) warn that instructors must do more to help these students with their critical thinking and information literacy skills, which can be weak for those who are used to skimming vast amounts of information for instant quick answers but not necessarily processing much of it in depth. Barnes et al. also suggest that instructors should use these students' social networking skills to encourage the students to think more in depth about course material outside of the classroom, but the instructor needs to be an active participant in this process with clear goals. Baird and Fisher (2005–2006) believe "the key to a successful online user experience is to help students find ways to construct relationships with their peers" so that "these self-directed elearning communities could then provide resources, increase engagement in the course content, as well as provide a 'network of knowledge transfer'" (p. 14).

Dunlap and Lowenthal (2011) believe using Web 2.0 technologies that students are already familiar with can help support lifelong learning by considering these objectives:

- Develop student autonomy, responsibility, and intentionality.
- Encourage reflection.
- Enculturate into a community of practice.
- Encourage discourse and collaboration; and
- Provide intrinsically motivating learning activities (p. 5).

To our knowledge, social media use within the introductory statistics classroom has not yet been fully investigated, and in our search of the literature, we could find no published reports of social media use in the teaching of statistics. However, over the years, statistics education researchers have been slowly paving the way for an exploration of the implications of social media and other Web 2.0 technologies in the modern statistics classroom. In 1995, David Moore, George Cobb, Joan Garfield, and William Meeker, four leaders in the statistics education community, were asked to share in a *fin de siècle* discussion their views about the future of statistics education in light of "new" technology, particularly widespread use of the Internet (Moore, Cobb, Garfield, & Meeker, 1995). In 1995, the excitement about technology primarily focused on the ability to put course files online for students to print out and also on the ability to e-mail announcements and answers to questions directly to the whole class of students. Garfield, while excited about the possibilities of new technologies, was concerned that the human aspects of teaching and learning would be minimized in the future. She said: "Human beings are by nature social, interactive learners. We check out our ideas, argue with others, bounce issues back and forth, and increase our understanding of ourselves and others etc. Important components of good teaching include communicating high expectations and respecting diverse talents and ways of learning" (p. 253).

Garfield and Meeker both recommended that students do more active learning, especially outside of class time, and Moore wrote:

> "Students bring a complex mix of knowledge and intuition, both correct and incorrect, and learn by constructing their own understanding through interpreting present experiences and integrating them with their existing understanding. . .Students must be active participants in learning. The teacher shapes an environment for learning through setting tasks, encouraging open discussion and group problem-solving, and insisting that students express clear conclusions from their work orally or in writing. . .The practice of statistics involves a dialog with data rather than once-for-all analysis, contact with other disciplines, and a team approach, so the new style of teaching is easily accepted by those who want to bring teaching closer to practice" (Moore et al., 1995, p. 254).

Interestingly, these visionary statistics educators were extolling the benefits of social media in our classrooms without it even being invented yet. Even the concerns of Garfield about human interaction can be taken into account with social media.

In 2003, the American Statistical Association sponsored a committee that resulted in the creation of the Guidelines for Assessment and Instruction in Statistics Education (GAISE) College Report (Aliaga et al., 2005). The GAISE College Report recommendations include using real data, emphasizing statistical literacy and conceptual understanding rather than rote problem-solving, using assessment creatively, and incorporating active learning. Statistics educators will recognize how many books, articles, presentations, etc. have been impacted by the GAISE College Report. Although this report was written before Web 2.0 applications were commonly used (or available), the guidelines are open and flexible enough that social media fits in well.

More recently, in his "Statistics and the Modern Student" article, Gould (2010) made a case for the need to re-think how we are teaching the introductory statistics course in light of the fact that "modern students" are learning about data well before they set foot in the classroom. We might also argue that "modern students" are interested in certain technologies and are using these technologies (e.g., Facebook) outside the classroom, and we may be able to engage them more by trying to find ways to incorporate these technologies in our teaching. As will be illustrated later in this article, social media technologies have the potential to involve both our online and traditional students in meaningful discussions, activities, and learning opportunities.

Our purpose here is to first investigate three popular social networking sites (Facebook, Twitter, YouTube) and view them through the lens of educational research. How exactly have these sites been used by educators in college classrooms and what is the potential for their use with college-level students? We follow this with examples of ways in which we have attempted to incorporate social media into the teaching of introductory statistics. Because social media is outside the control of individual universities and their agreements with their students, we follow our examples with some recommendations and cautions when using social media in the classroom. We then conclude with future suggestions and considerations as social media and our understanding of its use continues to develop.

## 2. Facebook (www.facebook.com)

Facebook was created in 2004 at Harvard and was originally meant to be a social networking site for college students (initially college students at Harvard) (Boyd & Ellison, 2008). Facebook soon expanded to include high school students, professionals, and, eventually, anyone who was interested in joining. As of October, 2012, Facebook claimed to have one billion monthly active users (http://newsroom.fb.com/Key-Facts). Facebook is a site where users can build profiles and make those profiles public to certain individuals. Social interaction is at the core of Facebook, and those who become members of Facebook can invite other Facebook members to be "friends." Users can then share information with friends in their Facebook network in a variety of different ways (e.g., by posting status updates, uploading photos, embedding videos from YouTube). Users can also keep up with what their friends are posting via the "mini-feed" (or a listing of status updates and other posted information from friends in the user's network) that is shared when an individual first logs on to Facebook (Downes, 2008). By virtue of the fact that the feed includes recent entries from others in a person's network, it allows users to quickly catch up with a variety of people in a short amount of time. Facebook also allows for different privacy settings that its users should consider carefully when thinking about who should have access to their profiles.

The prominence of sites like Facebook in the lives of college students (and younger students) has led some educators to question whether social networking sites have a place within the classroom (Selwyn, 2009). Selywn describes some of the enthusiasm expressed by educators about the power of social networking sites to provide easy ways for instructors to connect with students, and to motivate students to be active rather than passive learners, and Munoz and Towner (2009) nicely lay out many of the features of Facebook that make it an attractive candidate for inclusion within an educational setting. For example, Facebook is equipped with tools like bulletin boards, instant messaging, and e-mail, and these tools allow for easy sharing of information among users and collaboration opportunities (and might even be easier to use than similar tools within learning management systems like Blackboard or Moodle). Facebook is also appealing, according to Munoz and Towner, because of the way in which it might increase teacher-student interaction by providing teachers with a forum where they can connect with students—outside of the classroom—about upcoming assignments, upcoming events, useful links, and samples of student work. Schwartz (2010) goes as far as to consider Facebook to be almost like the new classroom commons: "For those who want to be appropriately accessible to students in the cyberhallways they frequent, while also keeping in touch with everyone from our kids to old friends, Facebook is worth considering as a communal space, albeit one that requires discretion" (p. 39).

There is no escaping the fact that students are using Facebook outside of the classroom, but, as Roblyer, McDaniel, Webb, Herman, and Witty (2010) point out, little research has been reported on the acceptance or use of social networking tools like Facebook in educational settings, and what has been published offers mixed perspectives about the utility of Facebook in the classroom. In a review of empirical research on students' and teachers' use of Facebook, Hew (2011) noted that few education-related activities were found in the literature he reviewed, and he questioned whether this might be the result of the sentiment among students that Facebook is a place to socialize and thus should be kept separate from academic work. Indeed, Madge, Meek, Wellens, and Hooley (2009) found, when surveying 213 British undergraduate students about how they used Facebook for academic purposes, students were more likely to indicate that Facebook had potential for informal learning opportunities (like talking with peers about academic-related matters) but not for formal teaching purposes. Only 10% of the students surveyed by Madge et al. reported using Facebook regularly to discuss academic work with others, and less than 1% had used Facebook to make contact with university staff. Further, when directly asked if they believed Facebook could be used in a way that might enhance teaching and learning, 43% of the students said "no" and explained that Facebook was meant for social networking, not academic work. Perhaps it is not surprising then that Selwyn (2009) found that, when analyzing the 68,169 public wall postings of 612 undergraduates (over an 18-week period) at a university in the United Kingdom, only 4% of the total postings were considered to be of an educational nature (i.e., related to studies or to the students' university experiences). Education-related use of Facebook included recounting or reflecting on the university experience, exchanging practical information (e.g., about what courses to take, scheduling of courses, locations of lectures), exchanging academic information (e.g., asking questions about topics in courses that were not well understood, asking questions about required readings), offering moral support related to the assessment and learning process, or sharing feelings of disengagement as far as academics were concerned.

Bosch (2009), Roblyer et al. (2010), and Sturgeon and Walker (2009) surveyed both students and faculty about issues related to Facebook use and found, unlike Madge et al. (2009), that students appeared more open-minded to the prospect of using Facebook for educational purposes. To better understand how students use Facebook, Bosch analyzed the content of 200 Facebook profiles from students at the University of Cape Town in South Africa, and she also conducted semi-structured interviews with 50 undergraduate students and with 5 lecturers who were currently using Facebook as a way to engage with students. Although she did not cite exact figures from her survey to back up some of her statements, Bosch noted that "students who were engaged in academic Facebook groups actively participated in these, and welcomed the use of the online social networking tool for academic purposes in addition to the social. In most cases, students reflected that they were already spending lots of time on Facebook, and that being able to check class-related material while at the same time engaging in personal communication was useful" (p. 195). According to some of the lecturers Bosch interviewed, Facebook might also have benefits in terms of leading to more effective use of class time, especially if lecturers can tailor their classroom presentations to the material that students are asking questions about or discussing on Facebook. Further, Facebook interactions between teachers and students could also have implications for how approachable students feel their instructors are.

Roblyer et al. (2010) gathered data from 120 students and 62 full-time and part-time faculty from a mid-sized, Southern United States, public university to better understand student and faculty use of Facebook and perceptions of Facebook as a classroom support tool. It was observed that neither the faculty nor the students who were surveyed used Facebook much for instructional

purposes, but students were more open than faculty to the prospect of using Facebook within educational settings. Why faculty might be more skeptical about the role of Facebook in the classroom was not made clear, but it did not appear that faculty or students were overly concerned with the perceived invasion of privacy that might result if they were connected to each other on Facebook. In a similar survey of 74 students (mostly undergraduate) and 72 faculty members at a private southern university, Sturgeon and Walker (2009) observed that students tended to feel more comfortable communicating with instructors and tended to feel more connected to instructors as a result of Facebook interactions, but instructors did not always share these feelings of connectedness with their students. In interviews with 12 instructors, Sturgeon and Walker noted that whereas most of the interviewed instructors felt that Facebook had the potential to be a useful academic tool, there was concern about possibly blurring the lines between being a teacher and being a "friend," which might lead to problems within a classroom environment. It is possible this is why—although popular—Facebook is not being used extensively within the classroom or as part of out-of-class assignments (Moran, Seaman, & Tinti-Kane, 2011). In a survey of faculty use of social media conducted by the Babson Survey Research Group and Pearson Learning Solutions, Moran et al. found that 57% of the 1,920 surveyed faculty members use Facebook for personal reasons, but less than 5% indicated that they had used Facebook in the classroom or created out-of-class assignments for students that would require use of Facebook. As Green and Bailey (2010) observe, "Facebook seems to be like the American Old West—a vast, wild, and somewhat lawless place that has attracted diverse groups of individuals seeking to stake a claim and leave their mark. Thus, we suggest approaching the use of Facebook for instruction with a sense of adventure and potential, but with eyes wide-open and with caution" (p. 22).

Although sparse, there are some published reports where educators have attempted to describe specific uses of Facebook in educational settings. Schroeder and Greenbowe (2009) attempted to use Facebook to explore whether the popular social media site could increase the sense of community among students in an organic chemistry laboratory. Students taking an introductory organic chemistry laboratory were invited to join a Facebook group for the laboratory where they could discuss questions with each other (and the instructor and teaching assistants) and also compare results of their work to identify trends with their data and generate more precise results. The Facebook group was pitched to students as an alternative space to the traditional learning management system WebCT for them to engage in discussions outside of class. Students were still encouraged to use WebCT to check their grades and learn about course announcements, but they were given the option of being part of the Facebook group as well if they wanted to be. At the end of the semester, 52 out of 128 students had joined the Facebook group, and Schroeder and Greenbowe found that whereas 8 discussion topics that generated 17 posts emerged within the WebCT discussion forums, 20 discussion topics that generated 67 posts emerged within the Facebook group. Further, it was observed that the discussion within WebCT abruptly ended early in the semester, but the discussion on Facebook continued throughout the semester and was often more complex than that on WebCT. Students would use Facebook to communicate with each other about impending assignments and often receive quick responses from peers. Schroeder and Greenbowe speculated that students used Facebook more often because they were already accessing the site for personal use and it was easy then to simply "check in" to the chemistry group to see if anything was going on there.

Charlton, Devlin, and Drummond (2009) found Facebook to be a tool that worked well to connect students from two different universities who were studying similar modules in software design and needed to collaborate as software development teams for a course project. Although many platforms were set up to provide the teams with opportunities to communicate (e.g., Skype, wikis, e-mail, instant messaging), Charlton et al. noted that students typically had problems with these technologies, for various reasons, and, without instructor prompting, began to turn to Facebook as a way to connect with their teammates. When students were surveyed about their attitudes toward using Facebook to communicate with their peers, Facebook was listed as a preferred means of communication, and most students indicated that they used the chat feature in Facebook to communicate with teammates (followed by e-mail messages within Facebook, discussion board posts, and wall-to-wall posts). Further, 60% of the 83 students who responded to the Facebook survey indicated that Facebook helped them achieve more familiarity with each other and trust in each other, and 84% indicated they would be comfortable interacting with teammates using Facebook. One reservation students expressed, however, had to do with feeling forced to add their teammates as "friends" on Facebook. The results of their survey led Charlton et al. to develop an Internet application called CommonGround that could run on the Facebook platform. This allowed students to have a virtual meeting space within Facebook without having to "friend" all members of the software development team (see Charlton, Devlin, Marshall, & Drummond, 2009, for more details on CommonGround).

Within the medical school community, Facebook is a tool that students are using more and more to form study groups, to support one another, to create new social connections, or to reinforce existing social connections (Gray, Annabell, & Kennedy, 2010). Green and Bailey (2010) write about the study group "Medical Mnemonics" that was set up on Facebook for students to share study aids and mnemonics to remember things such as bone names and disease symptoms. Gray et al. describe the results of a survey of 759 medical students, and roughly 25% of these students indicated they had used Facebook for educational reasons. In most cases, it appeared that students were using Facebook to study for exams, to work together on specific projects, or to get help and support for various assignments and courses. Although students seemed positive about their experiences with Facebook, they appeared to consider Facebook to be more of a "social study space" that was off limits to university staff, and this led Gray et al. to question whether educators would do more harm than good by trying to formalize the use of Facebook in the classroom.

Baran (2010) actually did try to "formalize" Facebook in an educational setting—on a small scale—by requiring that the 32 undergraduate students in her "Distance Education" course use a group she created in Facebook to build and discuss a library that included videos, links, and pictures related to the course. Baran told students they would be graded on their Facebook-based activities but did not include information in her article about just how the students were graded, what portion of their grade was based on use of Facebook, or how much of the course actually took place on Facebook. Given that she indicated that close to 43% of the students said they would have preferred a face-to-face course as opposed to a Facebook-based course, it seems that most, if not all, of the actual course may have taken place on Facebook. Students were surveyed at the end of the semester about their thoughts on the experience of using Facebook as part of their coursework, and, while 75% of the students thought Facebook should only be one element in a teaching and learning environment, 84.4% of the students believed that Facebook could be used for knowledge-sharing in formal educational environments. Over half of the students (65.7%) believed that grading Facebook-related work was reasonable, but several students (72%) were still largely undecided in terms of whether Facebook was of high value to teaching.

Further, 90.6% of the surveyed students indicated that Facebook helped them to maintain contact with the instructor, and 56.3% of them indicated that Facebook helped them to get to know their classmates better. Although Facebook might have a place within the classroom, Baran's study definitely calls into question whether it is practical or even ethical for an instructor to demand that students use Facebook and be graded on Facebook-related course work. Baran's class was small, and all but three of her students were already using Facebook before her course began. Whether a similar study could be conducted with a larger class (or a class with more non-traditional students) is not clear.

Like Baran (2010) and Wang, Woo, Quek, Yang, and Liu (2012) also attempted to use Facebook exclusively (instead of a formal classroom or learning management system such as Blackboard or Moodle) in two elective courses (one graduate-level course with 16 students and one undergraduate-level course with 15 students) at a teacher education institute in Singapore. Wang et al. not only wanted to describe just how Facebook could be used as a learning management system but also wanted to investigate students' perceptions of using Facebook in an educational context. For each class, students joined a Facebook group that was closed to the public, and their teachers posted announcements on the Facebook wall, engaged in discussion with students about different topics, and shared important resources (like links to text files, PDF documents, and PowerPoint presentations) by linking to a Google Docs page that housed these other materials.

Wang et al. (2012) found that most of their students were positive about the experience of using Facebook instead of a more traditional learning management system, at least in terms of how it promoted the learning of course material. There were concerns expressed, however, about the limits of Facebook. When students engage in discussions, they are limited in terms of how long a reply to a discussion topic can be, and this was something that some students did not like. The way in which discussions are organized can also be challenging and make it hard to follow discussions. Posts are displayed, within a Facebook group, in chronological order (beginning with whatever post has the most recent comment or reply), and this can make it hard to find and respond to older messages. Some students also worried that Facebook was not a secure environment and that even though the group was closed to the public, other individuals might still have access. Thus, although Facebook clearly can be used in lieu of a learning management system, Wang et al. caution educators to think carefully about both the positive aspects of Facebook and the constraints involved in using Facebook. Because their undergraduate students were more positive about using Facebook than the graduate students, Wang et al. suggest that Facebook might work better with younger students. Our own position is that Facebook and other social media tools should be used in conjunction with traditional learning management systems and that students should not be forced to use these tools if they are uncomfortable doing so.

## 3. Twitter (www.twitter.com)

Twitter—officially launched in 2006—has been described as an online application that is part blog, part social networking site, and part cell phone or instant-messaging tool (Educause, 2007). Twitter has at least 145 million users who post 50 million messages a day at a rate of 600 messages per second (Ferriter, 2010). Twitter allows users to post short messages (no more than 140 characters in length) and to easily follow the messages posted by others who are using Twitter.

In many ways, as Tagtmeier (2010) points out, Twitter is similar to Facebook. Both sites are considered to be social networking sites where individuals can communicate with others, keep in touch, and share information, although Twitter limits the amount of information you can share at any one time, within a single "tweet." Within Facebook, you make "friends," and in order to be a person's "friend," you have to accept a friend invitation from that person or he or she has to accept a friend invitation from you. In Twitter, you have followers, and, as Dunlap and Lowenthal (2009b) note, this makes Twitter less bounded and more open than Facebook since "in Facebook, if you befriend someone, they have to befriend you back, with the only other option being to not have any connection at all. In Twitter, you can follow someone who does not follow you; someone can follow you that you do not follow in return; you can follow someone who also follows you; or you can choose not to have or allow a connection between you and others" (p. 5). Tagtmeier argues that Twitter is a more active and conversational form of communication than Facebook, and he illustrates this with a vivid analogy: "Twitter has been likened to a giant party where you know no one but wish to make many friends. In contrast, Facebook would be a wedding reception filled with family and friends" (p. 8). He goes on to note that privacy seems to be more of a concern to Facebook users whereas Twitter users are more likely to embrace the feeling that everything is public in Twitter. Twitter may attract more interest-driven participation where people attempt to connect with others who share their interests and can answer their questions or provide them with information, whereas Facebook may attract those who are more interested in friendship-driven types of participation (Dunlap & Lowenthal, 2009b).

Soon after Twitter emerged as a social networking tool, Java, Song, Finin, and Tseng (2007) attempted to monitor the public updates of Twitter users for a period of 2 months in order to better understand why and how people were using Twitter. They noted that some of the main uses of Twitter appeared to be for daily chatter (i.e., people talking about daily routines or posting information about what they are currently doing), engaging in conversation, sharing information or URLs, and reporting news. Certainly, many of these uses could have important instructional implications within the classroom, but it appears, just as with Facebook, there may be skepticism among some educators about the educational merits of Twitter. Nagel (2009) reported the results of a survey of 1,958 higher education professionals conducted by Faculty Focus, and 69.3% of these respondents reported not using Twitter at all. Further, when asked to comment on why they did not use Twitter (specifically for educational purposes), faculty mentioned, among other things, that they did not always see the relevance of Twitter to education and they worried the 140-character limitation in Twitter might lead to poor writing skills. Of those faculty who did report using Twitter, it was more likely that Twitter would be used as a tool to collaborate with colleagues than as an instructional tool; of the 30.7% of higher education professionals who reported using Twitter, 7.2% said they used it frequently as a part of instruction and 9.4% said they used it occasionally as a part of instruction. A more recent survey of faculty use of social media conducted by the Babson Survey Research Group and Pearson Learning Solutions reported that of the 1,920 faculty surveyed, only 2% indicated they used Twitter in class or assigned students to use it outside of class and only 9% of faculty indicated they believed Twitter was somewhat or very valuable as a tool for classroom use (Kolowich, 2010; Moran et al., 2011).

Twitter is the newest social media tool reviewed in this paper, and it is possible that this, coupled with faculty skepticism about the usefulness of Twitter in the classroom, explains the dearth of published reports on the educational uses of Twitter. Dunlap and Lowenthal (2009a,b) and Dunlap and Lowenthal (2011) have written extensively about their uses of Twitter within an online classroom environment, and much of what they share might give other educators ideas about ways in which Twitter can impact the sense of community within any classroom environment. Frustrated by

some of the limitations they noted in traditional online learning management systems in terms of allowing students to more freely interact, connect, and receive timely feedback on questions, Dunlap and Lowenthal (2009a,b) turned to Twitter as a way to enhance the social presence in an online instructional design and technology course. Students were invited to use Twitter if they wanted to connect with other students in the course or with Dunlap and Lowenthal, or even with a more global community of practicing professionals to collaborate, share ideas, brainstorm, and problem solve. For the students who did not choose to use Twitter, Dunlap and Lowenthal were able to set up a Twitter feed within their learning management system so that all students could get a better sense of some of what was being posted on Twitter that related to topics covered in the class.

Dunlap and Lowenthal (2009a,b) reported that most students chose to use Twitter and felt the experience was positive. Students used Twitter to ask questions about course material or assignments, to share resources (like videos or links to blogs), to comment on things they were reading about or hearing on the news or television that related to the course, and to connect with their instructors or with professionals in the field. Twitter allowed Dunlap and Lowenthal to address student issues in a timely manner, encourage clear and concise writing among students (due to the 140-character limit for each "tweet"), model how to write for a professional audience, and help students form connections with a professional community of practice. Twitter also appeared more flexible than the learning management system in terms of supporting informal learning (i.e., helping students to discover resources and tools they could use for their coursework) and helping to maintain on-going relationships among students and faculty even after the course officially ended. Although they do acknowledge particular drawbacks of Twitter—such as its addicting nature, the possibility students might be charged fees if accessing Twitter via cell phones, and the bad grammar that could result from the 140-character limit—the instructional benefits Dunlap and Lowenthal observed were enough to encourage them to continue using Twitter, and they provide many helpful guidelines for other instructors who also want to use Twitter. Instructors are encouraged to establish relevance for students, recommend people (e.g., professionals in the field) for students to follow (in addition to following classmates and the instructor(s)), define clear expectations for participation, model effective Twitter use and actively participate in Twitter, encourage students' active and ongoing participation, and build Twitter-derived results into assessments (e.g., perhaps by encouraging students—when appropriate—to use information and resources obtained through Twitter participation in research papers, presentations, or other assignments) (Dunlap & Lowenthal, 2009a,b).

Although some might argue that the use of Twitter in an online environment—specifically with students who are studying instructional design and technology—may not have implications for the face-to-face classroom environment, or for other fields of study, several other educators have shared descriptions of how they have attempted to incorporate Twitter into a variety of different educational settings. Tobias (2009) writes about how college instructors are beginning to use Twitter as an extension of the classroom where they can ask questions, engage in discussions, keep up with breaking news, and share links to interesting stories. Wright (2010) reports the results of a case study where eight students participating in a teaching practicum used Twitter to reflect on their teaching practices. For a period of several weeks, students were asked to tweet a minimum of three times each workday in response to their experiences. To provide more structure to the teachers, Wright asked them to think about sharing what they were learning and thinking about in the moment, what their students were learning, what problems they might need to overcome or solve, where their learning was taking place, what they planned to do next, and what obstacles were getting in their way. In later interviews with the eight teaching practicum students, Wright noted that the students revealed the power of Twitter to help them consider not just what they were doing but why they were doing it, and the 140 character limit in Twitter forced them to think more deeply about what they were feeling in the moment. The students also appreciated being able to share reflections and receive supportive feedback and encouragement from their peers.

Silver (2011) describes his use of Twitter in a media-studies production course where students learned how to craft media about making food. He required his students to join Twitter and create public Twitter accounts, to follow him on Twitter and follow their classmates, and to get into the habit of checking Twitter at least once a day. For Silver, using Twitter was a way to simplify certain course management tasks because it served as a place for students to engage in discussion and resources sharing, and it was a way for him to make announcements to the class. Twitter also became a way for Silver to collect assignments from his students because he required that students post tweets with links to their work. As an example, for one assignment, the students needed to create a meal suitable for breakfast or lunch, document their cooking process with digital photos that they would upload into Flickr, manage the photos in a meaningful way in order to tell a story of their dish (which would include the recipe), and then tweet a link to their recipes and Flickr photos to the entire class before actually bringing the dish to class to share. Silver observed that as students posted their own dishes, they also responded to what their peers were posting and engaged in dialogue about the different recipes that were being shared. Another instructor at a different institution soon learned what Silver was doing on Twitter and incorporated something similar into one of her courses; this eventually allowed for cross-institutional collaboration.

Billiot (2011) chose to use Twitter with the students in her online undergraduate marketing course because she felt a lack of connection to these students, despite engaging with them via discussion boards within her learning management system and through e-mail. She believed Twitter might be a tool that could replace discussion boards altogether in the online course. Billiot liked the 140 character limit in Twitter and decided to require students to respond to discussion questions with just one tweet in order to learn how to be more concise and creative in their interactions. Billiot also saw Twitter as an excellent opportunity to connect students in the online and face-to-face sections of the marketing course she was teaching. Students in both sections worked on team projects where they needed to create social media campaigns that raised awareness of particular causes. As part of these projects, the students were required to tweet regularly about their progress and accomplishments, along with any challenges they were facing. Billiot found that using Twitter allowed for more real-time discussion among students and the instructor, in addition to bridging what she saw as a gap between online and on-campus students. Billiot also appreciated the fact that Twitter made her students' efforts more obvious, not only to her, but to them.

Although much of what is written about the use of Twitter in the classroom is based on educators' own experiences with Twitter or ideas for its possible use in educational settings, there have been some recent efforts to study Twitter in a more experimental and data-driven way. Junco, Heibergert, and Loken (2011) write about how they attempted to study the impact of Twitter use on student grades and student engagement within seven sections of a one-credit first-year seminar course for pre-health professional majors. Four sections of the course were randomly assigned to the experimental group (i.e., those who used Twitter as part of class) and three sections were assigned to the control group (i.e., those who did not use Twitter). In the experimental group, the instructors

used Twitter for a variety of purposes: continuing discussions outside of class; providing students with a "low-stress" way to ask questions; reminding students about due dates for assignments; helping students connect with each other; and organizing service learning projects or study groups. Each of the seven sections of the course also had a course website, and all of the information the instructors posted on Twitter was also posted on discussion boards within the class websites (so that students in the Control group would be privy to announcements made by the instructors or supplemental information posted by the instructors, and would also have opportunities to engage in discussion with peers). Students in the experimental group were required to complete certain assignments using Twitter and were given two optional assignments they could work through using Twitter. Although the experimental and control groups were found to be equivalent in terms of high-school GPA, Junco et al. (2011) noted that at the end of the semester, those in the experimental group had significantly higher GPAs than those in the control group (although it is not clear if the course work was similar across the two groups). Further, those in the experimental group were found to have a significantly greater increase in engagement from the beginning to the end of the end of the semester (based on responses to a subset of items from the National Survey of Student Engagement, or NSSE) than those in the control group. Junco et al. note that it is difficult to determine if these differences were based solely on the introduction of Twitter into the classroom, primarily because instructors were actively using Twitter and thus may have been more engaged with students in the experimental group as a result of their own interest and involvement in the study. Kassens-Noor (2012) used self-selected groups in a small class to compare an environmental studies project on sustainable living using either Twitter (with aliases to protect student privacy) or diaries with group discussion, followed by an unannounced quiz on how much information the students retained from the project. She concluded that Twitter was a good tool for creating group knowledge but Twitter was not as good for encouraging deep thinking (p. 19), and the traditional diary/group discussion students performed better on the quiz. Clearly, there are opportunities for researchers to perform well-designed experiments that involve using social media such as Twitter.

## 4. YouTube (www.youtube.com)

YouTube is a video-sharing website where users can upload, view, and share video clips, in addition to being able to comment on video clips, rate video clips, and engage in dialogue with others about those clips (Lehman, DuFrene, & Lehman, 2010). Founded in 2005 by three former PayPal employees, YouTube quickly gained momentum and was sharing 2.5 million videos per month just 1 year after its creation (Downes, 2008). YouTube was purchased by Google in 2006. In December, 2012, it was reported that there are over 800 million unique users who visit YouTube each month, with 72 hours of video uploaded to YouTube every minute (http://www.youtube.com/t/press_statistics). More than 50% of the videos on YouTube have been rated or include comments from viewers.

Some suggest that the educational uses of YouTube in the classroom might exceed those of Facebook and Twitter (Moran et al., 2011; Kolowich, 2010). When they surveyed 1920 faculty from various institutions on their use of nine different types of social media (including YouTube, Facebook, and Twitter), Moran et al. (2011) observed that whereas fewer than 5% of respondents indicated they used Twitter or Facebook in class or as part of student assignments, 61% of respondents indicated they had used online videos in class, and 32% of respondents indicated they had assigned online videos for students to view as part of assignments. Further, when asked about the value of social media tools for class use, over 70% of respondents indicated that YouTube had some value or was very valuable as a classroom tool; less than 20% of respondents felt this way about Facebook or Twitter. If YouTube is in fact a more popular educational tool than Facebook and Twitter, why and how can it be used in the classroom?

To accompany the reading of one of the main texts used in a cultural studies course, Trier (2007a,b) encouraged his students to bring videos, music, visual images, or other forms of what he referred to as "text" to class, on a voluntary basis, to illuminate or illustrate certain aspects of the reading. In addition to sharing his own ways of using YouTube in the classroom, Trier (2007b) offers advice to others about the myriad of ways YouTube can be made a part of the classroom experience. Not only can teachers share videos they believe will engage students or better illustrate certain concepts or ideas, but students can be asked to find and share videos, interpret videos for their peers, write responses to videos, or even create their own playlist page of YouTube videos (i.e., a page that is constructed to include links to user-selected videos) that relate to a particular topic. Trier also describes the power of YouTube in terms of helping instructors come up with innovative uses of video in the classroom.

In the health education and nursing communities, YouTube provides the means for educators to (a) incorporate short video clips into presentations in order to better illustrate certain topics, (b) share up-to-the-minute clips of government officials discussing current health issues or, (c) easily bring in "guest speakers,"(d) engage students in dialogue about health-related issues presented in video clips, and (e) get students more excited about becoming health care educators or nurses (Akagi, 2008; Burke & Snyder, 2008; Skiba, 2007).

Ng and Hussain (2009) describe a project they used in a course called "Technology and Innovation in Education." The 95 students in the course were studying to become secondary school teachers. Each student was required to design and create a 3-min video (in their chosen subject matter area) that would be targeted to either secondary school children or secondary school teachers. Reasoning that it would not be feasible for 95 students to present their video clips in class and receive constructive feedback from their peers, Ng and Hussain required that students post their video clips on YouTube and encouraged students to take time to rate and comment on their peers' videos by following specific criteria outlined in the assignment. Although they do not report on just how many students provided feedback to their peers, Ng and Hussain attempted to explore (through the use of surveys and semi-structured interviews) students' perceptions of the assignment, and specifically, their perceptions of the process of providing feedback to their peers and receiving feedback on their own work. Students appeared to appreciate the opportunities to provide feedback at times that were convenient to them, outside the confines of the classroom. Ng and Hussain noted one case in particular where a student responded consistently to the feedback he received from peers and attempted to clarify the purpose of the video and the types of improvements he thought he could make if he were to create another video. Other comments from students indicated that some felt the assignment helped them think more critically and see ways they could do better in their own work. Throughout their paper, Ng and Hussain carefully describe how other instructors might set up a project of this nature, and they also offer suggestions for how the project might be improved upon.

Lehman et al. (2010) describe a class project that was part of a communication ethics course. They appear to have chosen to use YouTube in this project because of the belief that this was a cutting-edge social media tool that would be a way to engage today's more media savvy students. Student teams were formed to analyze specific case studies and then develop innovative video presentations that could be uploaded to YouTube and used as part of a com-

pany's formal ethics training program. Students not only had to create videos, but they also had to present them to their peers in class and then engage in question and answer sessions with the class about their videos. Lehman et al. offer practical guidelines for instructors about how to set up an assignment like this and how to better ensure that quality videos will be produced by students. They also share a sample grading rubric for use with a project of this nature.

Franz (2011) writes about the use of a YouTube writing assignment in a large organic chemistry lecture course with typical enrollment between 300 and 400 students per quarter. Students in her course were initially told they needed to write a script for a YouTube video that would involve choosing an important concept in organic chemistry and then presenting the concept in a visual way to other students. Students were told they needed to provide at least two examples of why the concept was important, and they needed to write a script or stage notes to describe how they would creatively and accurately convey information about the concept to other students in the class. When this assignment was first used, Franz gave students extra credit if they actually produced a YouTube video in conjunction with the assignment and uploaded it to a special YouTube group site she had set up for the class (192 of her 399 students did this); later iterations of the assignment made the YouTube video mandatory. When surveying the class about the YouTube assignment, Franz observed that most students were positive about the experience and felt it was a way for them to personalize their learning experience and better remember course material. Franz noted there were some technology-related issues that made it difficult for some students to submit or upload video files, and for this reason, she encourages other educators to enlist the help of campus resources (e.g., video labs or instructional technology experts) to assist students in completing this type of assignment. She also suggests that having students work with a partner could be beneficial in that it would give students more opportunities to discuss and explain challenging concepts.

## 5. How can social media be used in the introductory statistics classroom?

The previous sections of this paper attempted to review how Facebook, Twitter, and YouTube have been used for educational purposes in a variety of different courses, for different purposes. As already noted, to our knowledge, nothing has been written about how these tools can or have been used within an introductory statistics classroom. The authors of this paper have begun to explore the use of social media tools in their own introductory statistics courses. The authors have primarily focused on statistical literacy lesson plans using social media, but some good, conceptual discussions with students have resulted from these projects, and we believe there are ways social media can be used to involve students in statistical thinking and reasoning.

In the summer of 2009, Everson used Twitter as part of an extra credit assignment in a graduate-level introductory statistics course. There were 18 students enrolled in the course at that time, and students were asked to create Twitter accounts and to post up to 10 different links to articles in the news that related to the content of the course. Only a couple of the students already had Twitter accounts, and Everson showed the students how they could easily set up accounts. To receive full credit, Everson wanted the students not only to post a link to an article, but to share a critique or a question about that link that would demonstrate that they had read the article and were reflecting on the contents of the article and how it related to what they were learning in class. Everson shared some model examples with students (similar to the ones below) to get them started on the assignment, and she reminded them to end their posts with a hashtag—#epsy5261—so that she could easily search for their tweets and make sure they got credit for posting.

> Do TV food ads endorse nutritional imbalance? Nice example of the use of one-sample t-tests. http://bit.ly/d69Afe #epsy5261.
> Cows with names yield more milk than cows without names. Did they do a two-sample t-test? http://bit.ly/D3Wu #epsy5261.
> IQ and exercise. A huge sample size of 1.2 million, but no women in the sample! http://bit.ly/6B55g1 #epsy5261.
> Is using a Wii good exercise? Sample was pretty small here, and I'm not sure how it was selected. http://bit.ly/3ea0sK #epsy5261.
> Chewing gum and calorie intake. Should we be concerned that Wrigley Science Institute funded this? http://bit.ly/2PJ9Nm #epsy5261.

Of the 18 students in the class, all but one elected to use Twitter and participate in the extra credit assignment (an alternative extra credit assignment was created for the student who was not comfortable using Twitter). Students seemed to enjoy using Twitter, and Everson overheard more than one conversation either before or after class in which students were talking about what they might post on Twitter or about what they felt they were learning about the need to pay careful attention to media reports in which statistical information is presented. This led Everson to try her Twitter extra credit assignment again in the fall of 2009, in four different courses (two sections of the graduate-level introductory statistics course and two sections of an undergraduate introductory statistics course). Fewer than half of the students who were enrolled in these courses chose to use Twitter, and an anonymous survey of students administered near the end of the semester revealed that several students might have been more willing to engage in the extra credit opportunity had Facebook been used instead of Twitter. Some students remarked that they were not as familiar with Twitter as they were with Facebook, and it was sometimes challenging for them to share resources on Twitter and also write a short question or critique about these resources given the 140 character limit in Twitter.

Beginning in Fall 2010, Everson decided to try using Facebook instead of Twitter. She set up a closed group for her students on Facebook and encouraged them to use this group to post and critique articles they were finding in the news that related to the content of the course. The group is closed in that students first need to require permission to join the group; it is not publicly available for everyone to view. Everson also changed the nature of her Facebook assignment so that it would no longer be an extra credit opportunity for students. Everson created a 10-point assignment and gave her students a choice of how they could earn those 10 points. They could (a) join the Facebook group and post 10 different links to articles they were finding in the news that related to what they were learning about in the course (in addition to short critiques of those articles or questions they had about the research reported in the articles or the statistics shared in the articles), (b) find an article from an academic journal that used an analysis technique they learned about in the course and write a summary and critique of the article, following particular guidelines, or (c) use YouTube to create a short 3–5 min video in which they attempted to showcase something they had learned in the course and teach what they learned to someone else. Everson tried this assignment for the first time in two sections of her graduate-level course: a face-to-face section and an online section. Across the two sections there were 64 students, and roughly half of the students in each section chose to use Facebook to complete the course assignment (5 students

created videos, and all other students chose to write a critique of a journal article).

Compared to Twitter, the interface in the Facebook group seemed easier to use in that students could easily post the original URLs to articles they were finding (rather than having to first "shrink" the URLs—in order not to exceed the 140 character limit in Twitter–by going to sites like tinyurl.com or bit.ly). In Facebook, when hyperlinks are added to posts, the links become clickable, and often, photos from the original article will automatically appear along with the first few sentences of that article. Students were also able to write more of a "critique" about each article they post, and it is easier for students (and for the instructor) to respond to the articles that were posted and then see all the responses for the same article threaded together.

To better understand why students were electing to use Facebook for the assignment and what they thought about the assignment, Everson asked the students to complete an anonymous end-of-semester survey that was posted within a learning management system set up for the course. Responses indicated that some students elected to use Facebook because they were "on" Facebook quite often anyway, and it would be easy for them to complete the assignment because they were already engaged with and familiar with how Facebook works. Other students who elected not to use Facebook, regardless of the fact that they did have Facebook accounts, mentioned that they worried about using Facebook for coursework because they wanted to keep their personal lives separate from their academic lives. One student in particular worried that other students in class might be able to gain access to his or her personal profile, and he or she did not want that to happen. Comments on the survey have led Everson to think carefully about re-structuring the Facebook component of this assignment. In particular, it is important to make sure that students are aware of how to use the privacy settings in Facebook so they can participate in an assignment like this while still keeping their personal profiles hidden. Everson also found that while students posted many great articles and asked interested questions about these articles, students did not always engage in the kind of dialogue with her or with each other that she hoped Facebook would enable. Thus, in future iterations of this assignment, students were required to post up to eight links to media reports (along with critiques) and to respond to at least four posts from their peers. The requirement to respond to posts has led to much more discussion among students, and often, students will return more than four times to comment on what their peers have said or to continue a discussion. Several students even remain a part of the group after the course has ended, and it is not uncommon for former students to return to the group to post links to share links to articles that have caught their attention.

Gundlach also experimented—in a different way—with Facebook in her undergraduate-level introductory statistics course. In Fall 2009, Gundlach set up a Facebook group for students in her course. Approximately 1,000 students take this particular course each semester, and Gundlach believed that a Facebook group for the course might provide opportunities for students to post questions about course material and get assistance with course material outside of class time. Gundlach posted to the site announcements about help sessions and reminders about due dates, which were also presented in the syllabus and announced in class for the traditional students and in the learning management system for the online students. Gundlach and the students posted and commented on interesting statistics-related articles found in the news. The Facebook page for this course was set up to be an open group where anyone could join. Gundlach chose the open group option because there are over 1000 students in the course each semester, and approval for individual students to join the site would have been time-consuming. Instructors from other universities, instructors from other courses, and previous students have joined the site in addition to current students. The site does not remove members at the end of the semester. Approximately 200 students joined the site, although most did not post on the site on a regular basis. Information was included in the course syllabus about the site, but many students indicated—via a non-anonymous end-of-semester survey—that they did not use the site more often because they either forgot about it or they felt that e-mail communication with the instructor was easier. Levels of participation varied from one semester to another. Some semesters, several fairly vocal students would use the site quite a bit, and then it became a valuable "frequently asked questions" library. Other semesters hardly anybody would use the site. Gundlach did not offer any course credit for participation on Facebook because she did not want students to feel obligated to use it if this made them uncomfortable. More effective use of Facebook might be encouraged by more frequent reminders about the site in class or by e-mail, privacy guidelines so students know how to keep their class Facebook presence protected from their personal Facebook presence, and demonstration in class by screen shots of good academic Facebook practices might encourage more effective use of the site. Gundlach currently uses Mixable (http://www.purdue.edu/mixable/), a system similar in format to Facebook but developed at Purdue University to allow privacy-protected social media experiences for students enrolled to particular courses, to do a mandatory article posting/commenting statistical literacy project for credit similar to Everson's project.

Whereas the use of tools like Twitter and Facebook may be relatively new within the statistics classroom, videos are not unfamiliar to statistics educators. Under the "Resources" tab at the website for the Consortium for the Advancement of Undergraduate Statistics Education (www.causeweb.org), one needs only to click on "Fun" and then "Video" to find videos that have been used in classrooms, some of which even appear on YouTube. Even the U.S. Census Bureau produced a video for World Statistics Day 2010 that can be found on YouTube (http://www.youtube.com/watch?v=kO-o2QAxRRc). This video could be used on the first day of class to stimulate discussion about what statistics are and why they matter, as could a clip from the popular "Joy of Statistics" series http://www.youtube.com/watch?v=en2ix9f8ceM,or a video created by the SAS Software company about the 2013 International Year of Statistics (http://www.youtube.com/watch?v=nTBZuQR7dRc). As of December 12, 2012, the U.S. Census Bureau had 261 videos posted on YouTube, many of which could be used within a statistical classroom. A search for "World Statistics Day" on YouTube results in videos from Statistics Canada, the World Bank, and UNICEF, just to name a few. A search on YouTube for "AP statistics" shows many videos created as projects for high school classes. Some of these videos are simply students explaining a particular concept, but many of them are quite creative such as songs, commercials, or skits. If the high school students are capable of using YouTube to show their mastery of statistical concepts, should we expect something similar to happen in the college classroom?

In addition to using Facebook and Twitter, both Everson and Gundlach have used YouTube in different ways in their classrooms. Videos from YouTube that relate to statistics can be shown in class, if possible, or can be posted on a course website so that students can refer to them outside of class. Everson, for example, shares a clip with students about the Monty Hall problem (http://www.youtube.com/watch?v=mhlc7peGlGg) after a class activity involving that problem. Gundlach has incorporated videos on experiments/sampling design and the Normal distribution in both her traditional and online lectures. Gundlach has also given students class participation points if they can find a comic strip or YouTube video related to the material covered in class and then write a short paragraph in which they describe why the cartoon or video is relevant, what (if anything) was used or explained differ-

ently in the cartoon or video compared to what was covered in class, and whether or not the statistical concepts in the cartoon or video are used appropriately. Gundlach also tries to include links to YouTube videos in her Calibrated Peer Review (CPR) writing assignments so that students can better understand how experiments in articles they are writing about were performed. For example, in a CPR assignment about the mating habits of male bowerbirds with either live female bowerbirds or robot female bowerbirds (“fembots”), the following videos were provided as additional resources:

- Video of a male bowerbird courting a live female bowerbird. www.youtube.com/watch?v=Ii2D9Bd5OoE.
- Video of a male bowerbird courting a fembot. www.youtube.com/watch?v=J-mF8_0hvPA.
- Video of what can happen when the research does not go as planned. www.youtube.com/watch?v=7Vf5U0MOXoY.

For a CPR assignment about how human male dance moves can affect women’s opinions, videos about how the data were collected and examples showing both good and bad dancers were provided to help the students understand the important features of the journal article.

- www.sciencefriday.com/program/archives/201009104.
- www.youtube.com/watch?v=m9xThNyPWdc.

As noted above, Everson also now gives her students the option of creating a YouTube video to receive credit for a particular course assignment. Students are asked to create a short 3–5 min video that would be useful in terms of teaching someone else about something the students learned in class. Everson leaves the assignment fairly open-ended so that students can choose a topic they feel comfortable with, and she attempts to point out ways they might consider creating videos if they do not personally want to appear in the videos. For example, she makes her students aware of Xtranormal, a movie-making Internet site (http://www.xtranormal.com/) to help the students create animated videos. Everson also shares an example of an Xtranormal video that was created about statistics: http://www.youtube.com/watch?v=PbODigCZqL8). Before students complete their videos, they are first asked to run their ideas past Everson just to make sure they are appropriate. When this assignment was used for the first time during Fall 2010, five students elected to create videos. Three videos were created on the Xtranormal site and focused on the topics of sampling and sampling distributions. Another video involved a student explaining the Empirical Rule, and a final video involved a student critiquing an article he had read that related to content covered in the course.

Although sharing videos that seem to relate to or expand on course content and asking students to find and share or even create their own videos are ways in which YouTube can be incorporated into the statistics classroom, there are other innovative ways in which an instructor might be able to use YouTube to engage students in discussion and dialogue about statistical concepts and ideas. For example, a tool created at the University of Minnesota called VideoANT (Hosack, 2010) allows for individuals to take videos that are online and create text-based annotations within the time-line of the video. Using this tool, an instructor could easily create an assignment where students are asked to respond and discuss particular parts of video clips, or students could share video clips with each other that they have created and then critique these clips by inserting questions or comments at specific places in the timeline of the video. Purdue University has developed DoubleTake, a tool to assist peer review and grading of student-created videos (http://www.itap.purdue.edu/studio/doubletake/).

## 6. Recommendations and cautions when using social media in the classroom

As we have attempted to incorporate social media into our own courses, we’ve found it important to be mindful of how this can be done in a way that is ethical and that does not make our students feel uneasy or uncomfortable. Rather than use social media for the sake of using it, we have chosen to incorporate social media into our courses in ways that we hope will be meaningful and beneficial to our students, and we have thought very carefully about how to avoid potential problems that have been cited in the literature about using social media in educational settings.

Certainly, one issue that all instructors should be mindful of is how the use of social media will adhere to the Family Educational Rights and Privacy Act (FERPA), a Federal law that protects the privacy of student education records and that applies to all schools that receive funds under an applicable program of the U.S. Department of Education (U.S. Department of Education, 2012). This law gives parents rights with respect to their children’s education records, but the rights transfer to the student when he or she reaches the age of 18 or attends a school beyond the high school level.

Those who choose to use social media in their own classrooms should make sure to check their institution’s FERPA policy guidelines. As noted by Orlando (2011), FERPA is sometimes misunderstood by educators, and with advances in technologies that make it possible for more and more exchanges among students and between students and the instructor outside of the classroom, it is important for educators to understand how to use social media in responsible ways. If using social media for classroom purposes, instructors must ensure that students are aware of how the things they are posting may be viewed by the public and about ways they can ensure their privacy. Instructors should not share student grades when interacting with students in social spaces such as Facebook, Twitter, or YouTube. Further, in our own uses of social media within the classroom, students are not forced to sign up for Facebook or Twitter accounts if they do not want to, and using social media is not something that is required. An instructor who wishes to “test the waters” using social media should think carefully about alternative assignments or ways of obtaining information for students who do not have social media accounts or who are not comfortable using social media for educational purposes.

Rodriquez (2011) nicely summarizes a variety of issues that educators should consider when using social media within higher education settings. Like Orlando (2011), Rodriguez discusses FERPA, and she notes the importance of instructors having discussions with their students about online privacy and what students should and should not expect when using social media sites. She also notes that instructors who use social media should inform their students about the kind of data certain sites might collect on their uses or share with their users. Rodriquez also raises questions about ownership and intellectual property that any instructor using social media should be aware of. There are also issues related to the accessibility of social media sites for students with disabilities, and the stability of social media. Further, any costs involved in using social media (e.g., cell phone charges, monthly fees) need to be made clear to students.

Friesen and Lowe (2012) remind users that social media companies such as Facebook and Twitter are, at core, businesses trying to make money, much like commercial television. These companies make money by showing advertisements and providing user data to potential clients. Friesen and Lowe ask social media users to consider how this exposure to advertisers changes the learning experience. They caution that while social media might seem like a good place for debates and discussion, Facebook in particular is designed around “conviviality” by only having a “like” button

and no "dislike" button. (p. 184) Advertisers do not want Facebook to create a dislike button because that could potentially harm business. On Twitter, a tweeter either has followers or not, without discussion. Advertisers want people to "like" their business/page, i.e. have a positive connection, or not be connected at all. Friesen and Lowe wonder if social media is therefore the best way to have discussions if "expressions of reservation, nuance, and qualification are made difficult if not impossible; and negativity in both its everyday and dialectical senses, is avoided" (p. 191).

Whether an instructor who is using social media should accept "friend" requests from his or her students is also an important consideration, and, as far as we can currently tell, there exists no clear set of guidelines about when or if this appropriate. The three authors of this paper are not even in agreement about this issue. One author routinely teaches graduate students and although she does not receive many Facebook "friend" requests from students, she tends to accept those that she receives, even if the students are currently in one of the classes she is teaching. The other two authors mostly teach undergraduate students and do not accept "friend" requests from their students until after the students are no longer in their classes or after the student graduates. The decision to accept these requests from students is obviously a personal one that each instructor will have to wrestle with. On the one hand, it is possible, as studies by Mazer, Murphy, and Simonds (2009) and Johnson (2011) demonstrate, that teachers might be perceived as more approachable and credible to their students if they are connected with students through social media and if they disclose personal things about themselves using tools like Facebook or Twitter. Of course, teachers need to be mindful about just what they are posting and who will see what they are posting, as Carter, Foulger, and Ewbank (2008) and Young (2009) point out by sharing several instances of teachers who have posted inappropriate material on social networking sites and have, in some cases, lost their jobs as a result. On the other hand, being "friends" with students on sites like Facebook or Twitter may give instructors a glimpse into the lives of their students that they are not prepared to embrace or deal with, and instructors should think carefully about this. For example, both Goode (2008) and Schwartz (2010) found, as soon as they opened their Facebook accounts, that students from their classes were requesting to be "friends," and generally, these requests were accepted. The issue for these instructors was not whether to friend or not, but how to interact with their students using social media, especially in cases where students might express frustration about a class or might share general concerns they have about material they are learning about. Schwartz found herself questioning whether she should respond if she noticed one of her students was frustrated about the homework in the class, especially if that student was merely posting this as a message on her Facebook wall and not reaching out to Schwartz personally. Goode, in contrast, worried that her presence on Facebook and her friendships with her students were somehow robbing her students of much needed opportunities to vent any frustration they were having with her course, especially after receiving low grades on assignments or assessments.

A separate but related issue concerns whether instructors should be the ones initiating "friend" requests with their students. None of the authors of this article send "friend" requests to their students. As Lipka (2007) notes, one issue with trying to forge connections with students through social media—even if well-intentioned—is that students may feel "forced" to interact with the instructor in ways they are not comfortable with. Jones (2010) writes about the "creepy treehouse problem" where instructors require that students interact with them using social media. Jones and his undergraduate student put together a list of best practices for making use of social media without creating the creepy treehouse: give clear explanations about why and how the tool is to be used, let the students take the lead in creating the social media space and how to use it so that it becomes their own treehouse, and adapt your use of social media to how the students will get the most benefits based on what you learn from observing the students' habits.

It is also important for instructors to think carefully, when using social media, about what their students do and do not know about how to use social media, or even what they know about how to use technology in general. It should not be assumed that students in today's college classrooms will automatically be "tech savvy," and it should also not be assumed that students who already routinely use Facebook or Twitter understand how to use or pay attention to the privacy settings that are built into these tools. Direct instruction about using social media and using it appropriately should be part of classroom discourse for any instructor who wants to introduce this into his or her course. Instructors should also be mindful of resources that can be helpful to students if they are being asked to use social media as part of an assignment. For example, if students need to create videos for a class project and post these videos to YouTube, the instructor needs to think carefully about whether he or she has the expertise to "troubleshoot" if students run into problems or need technical assistance along the way. Making a video project a group assignment might alleviate some of the burden on the instructor, especially if students can help each other along the way, but it may also help, during the planning stages of the assignment, for the instructor to investigate resources on his or her campus (such as library personal or instructional technology staff) who might be available to help students.

Young (2009) writes about a professor of consumer sciences and retailing at Purdue University who began to allow his students in his large lecture courses to use Twitter and Facebook in class to post questions during the lecture that the instructor can monitor (in the form of a constant stream of comments) and respond to or acknowledge during the lecture. When used this way (i.e., to provide the audience with a means to ask questions or make comments without verbally interrupting the instructor), Twitter is often referred to as a backchannel, and, on the positive side, it has the potential to allow shy or quiet students to ask questions anonymously. In addition to these reasons, one of the authors of this paper, Miller, is switching to Twitter for the backchannel in her large introductory statistics course because it affords a way for both online and in-class students to communicate on the same platform. On the negative side, backchannelling can sometimes lead to inappropriate comments or questions that have the potential to distract other students (if the stream of comments is displayed for the entire class to see) or lead the instructor to digress from the topic at hand (Dunlap & Lowenthal, 2009a). Miller has found that careful attention needs to be paid to the backchannel to keep students on task and student contributions need to be acknowledged to keep them interested in the backchannel. Young (2009) also writes about an assistant professor of history—Dr. Monica Rankin—who used Twitter as a backchannel in her American History class. Although Rankin felt that Twitter worked well overall, she described its potential for disaster by recounting an instance where students got into heated discussion and began arguing over a particular topic of discussion. With the help of a teaching assistant (who brought the heated discussion to her attention), Rankin was able to stifle that discussion and switch to a new topic. Instructors need to be active participants in any discussion to make sure that bullying and inappropriate comments are not allowed. This can be done by establishing ground rules for engagement in the backchannel and by careful monitoring of the discussion.

One final thing for instructors to be aware of when using social media is the ease with which it will be possible to track what students are doing and archive this information, especially if student grades are dependent on what they post using social media. This is

especially important when using Twitter. When Twitter first came up, it was possible to end posts with a hashtag (such as #stats) and then search for this hashtag in order to see everything that was every posted with this hashtag. This made it very easy for instructors to compile tweets from their students, or to access these tweets several days or even weeks after they were posted. Given the way Twitter has grown over the years, it is no longer possible for hashtags to remain active for long periods of time. Additionally, software that once allowed you to easily download and save tweets with particular hashtags (e.g., TwapperKeeper) have run amok of Twitter's terms of service (Sample, 2011). There are alternatives to TwapperKeeper, including the use of Google Spreadsheets or YourTwapperKeeper, but neither has been tried by the authors. Those who might want to use Twitter and archive hashtags are encouraged to look into these alternatives.

With the variety of concerns addressed here, one question is whether it is worthwhile for educators to use social media at all. Why not simply rely on the learning management system at one's institution in order to involve students in the kind of activity and discussion that we advocate using social media for? Clearly, this needs to be a personal decision made by an instructor, and we are not advocating that all instructors suddenly begin to use social media in their statistics courses. Some of the educators who have opted to use tools like Facebook and Twitter, like Dunlap and Lowenthal (2009a,b), Munoz and Towner (2009), and Wang et al. (2012), have noted that such tools might be more flexible in certain respects than learning management systems in that they might be easier for students to learn to use (especially if the students are already using these tools) and to access, they may allow for more timely feedback, they have the ability to connect students with peers from other courses or other sections of the same course, and they remain available to students well after a course has ended. The instructor who is debating using social media, either in conjunction with or in place of a learning management system, would obviously need to balance these "pros" with certain "cons," such as those outlined by Wang et al. (e.g., the ways in which discussion posts are organized, privacy concerns of students, and limitations in terms of the types of materials that can be easily shared with social media).

## 7. Conclusions and future directions

Naturally, one has to wonder, if social media is so important to our students, why is it not being used more in the classroom? Why, as Greenhow (2011) noted, has a research-based discussion of social network sites and education been virtually non-existent? Could it be because social media is seen as too casual to warrant serious study? Or, might it be a hesitancy to blend the professional with the personal? In this paper, we have attempted to review ways in which social networking sites such as Facebook, Twitter, and YouTube have been used as educational tools within college classrooms, and we have also attempted to illustrate how we have explored using these tools within the introductory statistics classroom.

With the popularity of social media sites, it is important to keep in mind that although certain technological tools are readily available, we should not use them just for the sake of using them. Academic use of social media can feel intrusive to the students if specific learning goals are not clearly communicated and if boundaries are not clearly stated and held. As we have argued in this paper, it is certainly tempting for the statistics educator to consider the use of social media in the classroom if it is seen as a pervasive part of students' lives. If students check their Facebook statuses before they even think about doing academic work, we need to seriously question whether it is pedagogically necessary to captivate the students by meeting them in Facebook. However, as Sternberg (2011) cautions, "...More times than not, (social media use in the classroom) does not work because it has to be a pedagogical decision first, rather than a technology decision. Plus, all these tools have their own culture and if you try to use them for something different, you're more often than not going to make mistakes."

In an article by Bradley (2009), Jane Hart is quoted as saying "the point of social media is to turn learning into a more participatory activity." Earlier in this paper we mentioned that our students multitask and that they are deeply emerged in social media. Rote learning may have worked for students in past generations, but the students we now teach have used technology, for good or for bad, to be engaged in their lives. By taking Hart's suggestion to use social media as a way of getting students to participate in their learning experiences, we believe in the potential of meeting the students where they are.

Where do we go from here? We hope this paper will serve as the starting point for more discussion among statistics educators about how social media can be used in a positive way in the statistics classroom. We also hope to be able to more systematically study the use of social media in the introductory statistics course. For example, are there ways we might study whether the use of social media can in fact engage and motivate our students more? What about learning outcomes? Can social media help improve statistical literacy, thinking, and reasoning? How might we measure this?

Of course, the instructors who use social media need to be wary of many things—many of which we've attempted to highlight in this paper—and they need to carefully question whether the pros outweigh the cons. We believe they do, but there is clearly much more we have to learn.

## References


Akagi, C. (2008). YouTube? for health education? *American Journal of Health Education, 39*, 58–60.

Aliaga, M., Cobb, G., Cuff, C. Garfield, J., Gould, R., Lock, R., et al. (2005), *Guidelines for Assessment and Instruction in Statistics Education College Report*. American Statistical Association. <http://www.amstat.org/education/gaise/>. (Retrieved 22.08.13).

Baird, D. & Fisher, M. (2005–2006). Neomillennial user experience design strategies: Utilizing social networking media to support "always on" learning styles. *Journal of Educational Technology Systems*, 34, 5–32.

Baran, B. (2010). Facebook as a formal instructional environment. *British Journal of Educational Technology, 41*, 146–149.

Barnes, K., Marateo, R., & Ferris, S., (2007). Teaching and learning with the net generation. Innovate, 3. <http://www.innovateonline.info/index.php?view=articleandid=382>. (Retrieved 08.22.12).

Billiot, T. (2011). In one online class, Twitter brings students together. *The Chronicle of Higher Education*. <http://chronicle.com/article/In-One-Online-Class-Twitter/129120/>. (Retrieved 08.22.12).

Bosch, T. E. (2009). Using online social networking for teaching and learning: Facebook use at the University of Cape Town. *Communication, 35*, 185–200.

Boyd, D. M., & Ellison, N. B. (2008). Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication, 13*, 210–230.

Bradley, P. (2009). Whither twitter? *Community College Week*.

Burke, S. C., & Snyder, S. L. (2008). YouTube: An innovative learning resource for college health education courses. *International Electronic Journal of Health Education, 11*, 39–46.

Carter, H. L., Foulger, T. S., & Ewbank, A. D. (2008). Have you Googled your teacher lately? Teachers' use of social-networking sites. *The Phi Delta Kappan, 89*, 681–685.

Charlton, T., Devlin, M., & Drummond, S. (2009). Using Facebook to improve communication in undergraduate software development teams. *Computer Science Education, 19*, 273–292.

Charlton, T., Devlin, M., Marshall, L., & Drummond, S. (2009). Encouraging interaction and status Awareness in undergraduate software engineering projects: The role of social networking services. Paper presented at *IEEE EDUCON Education Engineering 2010 – The Future of Global Learning Engineering Education*, Madrid, Spain, April 14–16.

Dede, C. (2005). Planning for Neomillenial learning styles: Implications for investments in technology and faculty, In D. G. Oblinger & J. L. Oblinger (Eds.), *Educating the Net Generation* (pp. 228–249). <http://www.educause.edu/educatingthenetgen>. (Retrieved 22.08.12).

Downes, S. (2008). Places to go: YouTube. Innovate. <http://innovateonline.info/>. (Retrieved 22.08.12).

Dunlap, J. C., & Lowenthal, P. R. (2009a). Horton hears a Tweet. Educause Quarterly, 32. http://www.educause.edu/EDUCAUSE+Quarterly/EDUCAUSEQuarterlyMagazineVolum/HortonHearsaTweet/192955. Retrieved on August 22, 2012.
Dunlap, J. C., & Lowenthal, P. R. (2011). Learning, unlearning, and relearning: Using Web 2.0 technologies to support the development of lifelong learning skills. In G. D. Magoulas (Ed.), *E-infrastructures and technologies for lifelong learning: Next generation environments* (pp. 292–315). London: University of London.
Dunlap, J. C., & Lowenthal, P. R. (2009b). Tweeting the night away: Using Twitter to enhance social presence. *Journal of Information Systems Education, 20*, 129–136.
Educause (2007). 7 things you should know about Twitter. <http://www.educause.edu/ELI/7ThingsYouShouldKnowAboutTwitt/161801>. (Retrieved 22.08.12).
Ferriter, W. H. (2010). Digitally speaking. *Educational Leadership, 68*, 87–88.
Franz, A. K. (2011). Organic Chemistry YouTube writing assignment for large lecture classes. *Journal of Chemical Education, 89*, 497–501.
Friesen, N., & Lowe, S. (2012). The questionable promise of social media for education: Connective learning and the commercial imperative. *Journal of Computer Assisted Learning, 28*, 183–194.
Goode, J. (2008). Let's just be friends. The Chronicle of Higher Education, 54. <http://chronicle.com/article/Lets-Just-Be-Friends/45856/>. (Retrieved 20.07.10).
Gould, R. (2010). Statistics and the modern student. *International Statistics Review, 78*, 297–315.
Gray, K., Annabell, L., & Kennedy, G. (2010). Medical students' use of Facebook to support learning: Insights from four case studies. *Medical Teacher, 32*, 971–976.
Green, T., & Bailey, B. (2010). Academic uses of Facebook: Endless possibilities or endless peril? *TechTrends, 54*, 20–22.
Greenhow, C. (2011). Online social networking and learning: What are the interesting research questions? *International Journal of Cyber Behavior, Psychology, and Learning, 1*, 36–50.
Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Web 2.0 and classroom research: What path should we take now? *Educational Researcher, 38*, 246–259.
Hew, K. F. (2011). Students' and teachers' use of Facebook. *Computers in Human Behavior, 27*, 662–676.
Hosack, B. (2010). VideoANT: Extending online video annotation beyond content delivery. *TechTrends, 54*, 45–49.
Java, A., Song, Z., Finin, T., & Tseng, B. (2007). Why we Twitter: Understanding microblogging usage and communities. In *Proceedings of the Joint 9th WEBKDD and 1st SNA-KDD Workshop 2007*. <http://ebiquity.umbc.edu/_file_directory_/papers/369.pdf>. (Retrieved 22.08.12).
Johnson, K. A. (2011). The effect of Twitter posts on students' perceptions of instructor credibility. *Learning, Media and Technology, 36*, 21–38.
Jones, J. (2010). The creepy treehouse problem. The Chronicle of Higher Education. <http://chronicle.com/blogs/profhacker/the-creepy-treehouse-problem/23027>. (Retrieved 22.08.12).
Junco, R., & Cole-Avent, G. A. (2008). An introduction to technologies commonly used by college students. *New Directions for Student Services, 124*, 3–17.
Junco, R., Heibergert, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning, 27*, 119–132.
Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of social media. *Business Horizons, 53*, 59–68.
Kassens-Noor, E. (2012). Twitter as a teaching practice to enhance active and informal learning in higher education: The case of sustainable tweets. *Active Learning in Higher Education, 13*(1), 9–21.
Kolowich, S. (2010). Professors and social media. *Inside Higher Ed.* <http://www.insidehighered.com/news/2010/05/04/socialmedia>. (Retrieved 22.08.12).
Lehman, C. M., DuFrene, D. D., & Lehman, M. W. (2010). YouTube video project: A "Cool" way to learn communication ethics. *Business Communication Quarterly, 73*, 444–449.
Lipka, S. (2007). For professors, "friending" can be fraught. *The Chronicle of Higher Education*. <http://chronicle.com/article/For-Professors-Friending/17980/>. (Retrieved 22.08.12).
Madge, C., Meek, J., Wellens, J., & Hooley, T. (2009). Facebook, social integration and informal learning at university: "It is more for socializing and talking to friends about work than for actually doing work". *Learning, Media and Technology, 34*, 141–155.
Mazer, J. P., Murphy, R. E., & Simonds, C. J. (2009). The effects of teacher self-disclosure via Facebook on teacher credibility. *Learning, Media, and Technology, 34*, 175–183.
Moore, D. S., Cobb, G. W., Garfield, J., & Meeker, W. Q. (1995). Statistics education fin de siècle. *The American Statistician, 49*, 250–260.
Moran, M., Seaman, J., & Tinti-Kane, H. (2011). Teaching, learning, and sharing: How today's higher education faculty use social media. Pearson Learning Solutions and Babson Survey Research Group: Boston, MA. <http://www.pearsonlearningsolutions.com/educators/pearson-social-media-survey-2011-bw.pdf>. (Retrieved 22.08.12).
Mullen, R., & Wedwick, L. (2008). Avoiding the digital abyss: Getting started in the classroom with YouTube, digital stories, and blogs. *The Clearing House, 82*, 66–69.
Munoz, C. L., & Towner, T. L. (2009). Opening Facebook: How to use Facebook in the college classroom. In Paper presented at the 2009 Society of Information Technology and Teacher Education Conference in Charleston, South Carolina.
Nagel, D. (2009). Most faculty don't use Twitter, study reveals. *Campus Technology*. <http://campustechnology.com/articles/2009/08/26/most-faculty-dont-use-twitter-study-reveals.aspx>. (Retrieved 2208.12).
Ng, H. Z., & Hussain, R. M. R. (2009). Empowering learners as the owners of feedback while YouTube-ing. *Interactive Technology and Smart Education, 6*, 274–285.
Orlando, J. (2011). FERPA and social media. *Faculty Focus*. <http://www.facultyfocus.com/articles/teaching-with-technology-articles/ferpa-and-social-media/?c=FFandt=F110207-FF>. (Retrieved 22.08.12).
Roblyer, M. D., McDaniel, M., Webb, M., Herman, J., & Witty, J. V. (2010). Findings on Facebook in higher education: A comparison of college faculty and student uses and perceptions of social networking sites. *Computers and Education, 13*, 134–140.
Rodriquez, J. E. (2011). Social media use in higher education: Key areas to consider for educators. *Journal of Online Learning and Teaching, 7*, 539–550.
Sample, M. (2011), The end of TwapperKeeper? (And what to do about it). *The Chronicle of Higher Education*. <http://chronicle.com/blogs/profhacker/the-end-of-twapperkeeper-and-what-to-do-about-it/31582>. (Retrieved 22.08.12).
Schroeder, J., & Greenbowe, T. J. (2009). The chemistry of Facebook: Using social etworking to create an online community for the Organic Chemistry laboratory. *Innovate*. <http://innovateonline.info/>. (Retrieved 22.08.12).
Schwartz, H. L. (2010). Facebook: The new classroom commons? *The Education Digest, 75*, 39–42.
Selwyn, N. (2009). Faceworking: Exploring students' education-related use of Facebook. *Learning, Media and Technology, 34*, 157–174.
Silver, D. (2011). Twitter meets the breakfast club. *The Chronicle of Higher Education*. <http://chronicle.com/article/Twitter-Meets-the-Breakfast/127379/>. (Retrieved 22.08.12).
Skiba, D. J. (2007). Nursing education 2.0: YouTube. *Nursing Education Perspectives, 28*, 100–102.
Sternberg, J. (2011). Social media's slow slog into the ivory towers of academia. *The Atlantic*. <http://www.theatlantic.com/technology/archive/2011/09/social-medias-slow-slog-into-the-ivory-towers-of-academia/244483/>. (Retrieved 22.08.12).
Sturgeon, C. M., & Walker, C. (2009). Faculty on Facebook: Confirm or deny? Paper presented at the 14th Annual Instructional Technology Conference, Murfreesboro, TN.
Tagtmeier, C. (2010). Facebook vs. Twitter: Battle of the social network stars. *Computers in Libraries, 30*, 6–10.
Tobias, S. P. (2009). College professors find Twitter a useful educational tool. *The Wichita Eagle*. <http://www.kansas.com/news/local/v-print/story/880654.html>. (Retrieved 19.07.09).
Trier, J. (2007a). "Cool" engagements with YouTube: Part 1. *Journal of Adolescent and Adult Literacy, 50*, 408–412.
Trier, J. (2007b). "Cool" engagements with YouTube: Part 2. *Journal of Adolescent and Adult Literacy, 50*, 598–603.
Troop, D. (2011). The Beloit College mind-set list welcomes the 'Internet class.' *The Chronicle of Higher Education*. <http://chronicle.com/article/The-Beloit-College-Mind-Set/128783/>. (Retrieved 13.08.12).
U.S. Department of Education (2012). Family Education Rights and Privacy Act (FERPA). >http://www2.ed.gov/policy/gen/guid/fpco/ferpa/index.html>. (Retrieved 13.08.12).
Wang, Q., Woo, H. L., Quek, C. L., Yang, Y., & Liu, Mei (2012). Using the Facebook group as a learning management system: An exploratory study. *British Journal of Educational Technology, 43*, 428–438.
Westerman, J. (2006-2007). When motivating Generation Y in the classroom. *Essays on Teaching Excellence*, (p. 18). <http://teaching.uchicago.edu/ete/06-07/Westerman.html>. (Retrieved 22.08.12).
Wright, N. (2010). Twittering in teacher education: Reflecting on practicum experiences. *Open Learning: The Journal of Open, Distance and e-Learning, 25*, 259–265.
Young, J. R. (2009). Teaching with Twitter: Not for the faint of heart. *The Chronicle of Higher Education*. <http://chronicle.com/article/Teaching-With-Twitter-Not-for/49230/>. (Retrieved 22.08.12).