Journal of Computing in Higher Education (2019) 31:81–104
https://doi.org/10.1007/s12528-018-9192-2

Using Twitter as a pedagogical tool in two classrooms: a comparative case study between an education and a communication class

Tian Luo[1] · Quan Xie[2]

Published online: 15 September 2018

Abstract

Extant literature on social media in education highlights the importance of improving social media-supported learning environments. This study adds to the literature by examining students' perception and participation for three types of Twitter-based instrumental activities—backchanneling, exploring hashtags, and topics discussion—in two unique undergraduate classrooms (education vs. communication) over the period of a 14-week semester. By employing a comparative case study research design, this study revealed insights into how students may respond to the same Twitter classroom integration activities to a varying degree according to their differences in pre-class perceptions and behavioral patterns. We found that both classes manifested an overall positive attitude toward the integration of Twitter in class along with active participation. However, the communication students manifested a more favorable pre-perception of Twitter and showed a higher participation pattern in class. We also provide pedagogical implications and recommendations for instructors intending to apply or replicate the three instructional activities employed in this study.

Keywords Twitter · Social media · Undergraduate classroom · Pedagogical use · Comparative case study

✉ Tian Luo
tluo@odu.edu

Quan Xie
qxie@bradley.edu

[1] Department of STEM Education and Professional Studies, Education Building #4106, Darden College of Education, Old Dominion University, Norfolk, VA 23529, USA

[2] Department of Communication, Slane College of Communications and Fine Arts, Bradley University, 1501 W Bradley Ave, Peoria, IL 61625, USA

Introduction

Initially developed as a social networking tool, Twitter has increasingly been used as pedagogical tool in a variety of contexts, thus garnering increased attention from educational practitioners and researchers (Gao et al. 2012; Tang and Hew 2017). Research reported that language teachers have utilized Twitter as a platform for students to practice their verbal and written communication as well as hone in their intercultural communication skills by being exposed to and conversing with native speakers on Twitter (Borau et al. 2009; Chun et al. 2016; Perifanou 2009). Psychology teachers used Twitter to post course-content items on a regular basis and reported that such practice helped students with information recall (Blessing et al. 2012). In lecture rooms or during presentations, business and education teachers adopted Twitter as a digital backchannel to promote real time feedback, encouraging students to raise impromptu questions or comments without interrupting the presenter or front-channel event (Cronin 2011; Luo 2015, 2016).

Despite a growing interest in using social media for teaching and learning, research on Twitter for educational purposes is in its burgeoning stage with many unanswered questions that have yet to be fully explored (Gao et al. 2012; Tang and Hew 2017). For example, some studies revealed significant variations in how educational practitioners and scholars use Twitter from various disciplines and backgrounds (Carpenter and Krutka 2014; Veletsianos and Kimmons 2016). Prior research also showed that student bodies emerging from varying disciplines have a tendency to respond differently to the social media's pedagogical use (Luo and Franklin 2015). To answer this research call, this study compared three Twitter-based learning activities (backchanneling, exploring hashtags, and topics discussion) in two distinct educational settings, an education versus a communication undergraduate classroom where the same instructional activities were implemented. In the paper, we will begin with a review of the literature on a brief introduction to Twitter, as well as its application as a communication and pedagogical tool. We also address the significance of comparing the three Twitter-based learning activities in two distinct classrooms. We then rationalize our choices for methodology including data collection and analysis. Our results and discussion sections provide detailed findings to our research questions, as well as practical guidelines and insights into using Twitter in two types of classrooms with disparate student population. The conclusion sheds light on the contribution of the paper and provides recommendations for future researchers interested in further exploring the comparative applicability of the Twitter integration in the classroom.

Review of literature

A brief introduction to Twitter

Twitter is a popular social networking tool where users post and interact with a short burst of information, often referred to as "tweets" that are limited to 140 characters. In academic terms, Twitter is often considered part of microblogging technologies

sharing the same attributes as Twitter, a class of service that allows users to publish and share brief updates for public view through the Internet (Dunlap and Lowenthal 2009; Gao et al. 2012). Since its first launch in 2006, Twitter is the most popular microblogging platform with 328 million active users, defined as people who logged in once a month at a minimum (Sparks 2017). According to Pew Research Center's latest report, roughly one-quarter (24%) of all online adults use Twitter, and Twitter is most popular among younger adults below 30, which constitute 36% of the entire adult population (Greenwood et al. 2016).

The simplest tasks one can do on Twitter is to post tweets and read other people's tweets. By signing up and logging onto Twitter, users are able to publish and share their brief updates with millions of people in the Twitter community. By subscribing to any other Twitter user's accounts, which is called *follow* in Twitter terms, users can create a personalized live stream of feeds that shows the recent tweets of all individuals he or she is following. Using a pound sign (#), which is called *hashtag*, as a keyword classifier, users are able to search for and explore tweets or join a conversation on similar topics. Users can also use the @ symbol before a Twitter username and/or insert it into a public post so that conversations can be directed to the intended user. A user can also reply to or repost another's posts, among which the second is called a *retweet*. Through these simple actions of tweeting, following, searching for hashtags, replying, and retweeting, interactions and collaborations can take place among people from virtually any corner of the world (Java et al. 2007).

Twitter as a communication tool

Twitter is often strategically and professionally utilized by organizations and businesses. Many organizations such as non-profits and religious groups use Twitter to build an online community where members can connect and communicate, creating infinite possibilities of engagement beyond the online sphere (Diaz-Ortiz and Stone 2011). Organizations also use Twitter for publicity purposes, because the online presence created by Twitter can be so powerful that it renders unlimited opportunities for these organizations. For example, Obama's presidential campaign in 2008 was one of the most influential examples that spoke to how an organization can utilize Twitter to its full strength (Stirland 2008). Not only used for publicity, Twitter has been used for advocacy, calling for actions, and fundraising, all of which have been tremendous successes (Auger 2013).

Twitter is being even more widely adopted in the business world. In 2016, 86% of Fortune Global 500 companies used Twitter (Barnes and Griswold 2016). Nowadays, almost all business groups are using Twitter as it holds unlimited potential. Many business groups use Twitter for marketing purposes (Brito 2011). By searching potential user groups on Twitter, companies can better understand their target consumers and therefore target the right clients with precision. A wide array of tools such as Sprout Social and Hootsuite provide measurements and analytics that help companies understand their marketing and sales performance (Smith 2009). In addition, Twitter creates tremendous opportunities to engage and network with customers. Interactions can occur directly and immediately on Twitter through simple Q&A types of live sessions. Feedback is personalized from

individual customers and often immediate, which is incredibly important to the success of a business. Twitter has penetrated into advertising, public relations, after-sales service and has helped millions with their sales and services (Brito 2011; Ojeda-Zapata 2008).

Twitter as a pedagogical tool

Previous research examining the use of Twitter as a pedagogical tool mainly focused on formal learning settings in which educational researchers and practitioners integrated microblogging into classroom learning activities (Tang and Hew 2017). In spite of differences in the subject matter across various disciplinary contexts, instructors have common means and manners to integrate Twitter to fit their own learning goals and purposes. In a systematic review, Gao et al. (2012) concluded that using microblogging tools like Twitter change four interrelated dimensions of learning: it broadens participants of the learning activities (who is learning), allows ubiquitous and unlimited time of learning (when to learn), expands the learning content (what to learn), and revolutionizes traditional means of learning (how to learn).

Scholars implemented various in-class microblogging-based synchronous activities to enhance student engagement, interaction, and collaboration. Kop (2011) reported that these increased levels of engagement enhanced the depth of learning and subsequently the learning experience. In his study, Twitter was incorporated in combination with other social networking tools to aggregate information and facilitate learning in an online course. In using such tools, students' level of presence increased, suggesting that students were more involved with the online activity and exhibited greater depth of learning. Perifanou (2009) conducted a series of microblogging-enhanced games in her Italian language class. Students learned in a more engaging and positive manner than in usual didactic lecturing. She stated that the use of microblogging provides unique communication channels for meaningful interactive learning, in which twenty-first century skills such as higher-order thinking are honed simultaneously with students' having fun.

Educators also employed Twitter to motivate students' learning interests, such as in literacy and language classes. For example, students were assigned to different characters in a play and asked to tweet to impersonate those characters so students may reflect their own understanding (McWilliams et al. 2011). Students' overall engagement and collaborative participation were reported to have improved in their studies. In Lomicka and Lord's (2012) French language classroom, Twitter was also used outside the classroom. Students posted tweets twice a week with many native French speakers located in France. The Twitter integration was perceived as successful by students, as it not only increased their opportunities for conversations among themselves and with the native speakers, it also leveraged students' community building to be achieved in a fun and interactive way.

In terms of facilitating student learning in traditional classroom lectures, Twitter as a microblogging tool has often been used as a backchannel to enhance students' virtual participation through opening up opportunities. A *backchannel* is a digital communication channel that is operated simultaneously alongside an event as it

unfolds in real time (Awad and Cocchio 2015; McNely 2009). In Elavsky and his colleagues' (2011) study, microblogging was used in a live event to encourage immediate participation from the audience. These researchers contended that the single speaker paradigm, as it often occurs in conventional lectures or conference presentations, constrains the presenter–audience interaction. The use of microblogging as a backchannel opens up for virtual participation and thus enhances the presenter–audience interaction (Cronin 2011; Luo 2015, 2016). Cronin's (2011) study also illuminated that the Twitter-supported backchannel was able to provide real-time feedback and comments that is not otherwise attainable in upper level graduate courses.

In addition, Twitter can be utilized both inside and outside of a face-to-face class to further classroom discussions and information sharing. Using Garrison and Arbaugh's (2007) Community of Inquiry model, Sinnappan and Zutshi (2011) found that Twitter is conducive to enhancing and complementing all presences in their study. When Twitter was used during a class, students' tweets revealed an elevated level of social, cognitive, and teacher presence. Pauschenwein and Sfiri (2010) adopted microblogging to cultivate participants' motivation for learning in five online courses. As the researchers stated, "micro-blogging environments can nourish participant's needs for relatedness, personal growth and transcendence and suggest the creation of strong social bonds within groups of participants in e-learning settings" (p. 25). Instructors in massive open online course settings adopted microblogging tools along with alternative social networking tools to disseminate and deliver information (de Waard et al. 2011; Kop 2011; Kop et al. 2011; Pauschenwein and Sfiri 2010).

Along with enhancing interaction and facilitating collaboration, studies showed that microblogging seems to have been appropriated to promote knowledge construction and content creation. In Hsu and Ching's (2012) class on instructional design, students were required to find graphics that contain design problems, use mobile phones to take a picture, and post on Twitter. Through sharing of the problem-design posts and discussions with peers, students were able to convert deep conversation into short but frequent message exchanges. By posting pictures and verbalizing various design problems found in the pictures, students conveyed meaningful messages on instructional design-related knowledge and thus internalized their learning in such microblogging-supported contexts. Through an examination of students' tweets and participatory observations, Dunlap and Lowenthal (2009) stated that students were found to be more engaged in information sharing, collaboration, brainstorming, problem solving, and context-based content creation. Social presence in this online course was highly elevated by the just-in-time social interactions via Twitter.

Purpose of the study

This study aimed to elucidate whether there is any variation in students' perception and participation in a communication versus education undergraduate classroom. Although little is known about how different students are engaged with Twitter prior to their exposure to Twitter's pedagogical use in a classroom, studies showed that

their reactions to exposure are often associated with previous behavioral and participation patterns (Tang and Hew 2017). In particular, studies indicated that students from different majors possess distinct characteristics with regard to prior use and perception of social media (Lewis 2010), which would consequentially exert an impact on their perception of any classroom integration (Luo and Franklin 2015; Luo et al. 2017). Students with a certain level of educational maturity (Cronin 2011) and familiarity in social media (Luo and Franklin 2015) tend to respond more favorably to the Twitter integration. As students from different disciplines present distinct personalities, motivations, and various characteristics in adopting social media (Crawford et al. 2013), it is meaningful to further explore how they experience Twitter differently when being exposed to the same Twitter activities in class.

Furthermore, education and communication, despite both falling into a social science and humanities subject domain, represents two unique disciplinary fields where results and implications of student participation as well as perceptions of Twitter are inconclusive. McCorkle and Payan (2017) contended that using Twitter as a learning tool in the communication classroom has not been subject to extensive research. Among the few studies exploring communication-related students' usage of Twitter, some found that undergraduates were generally positive about the use of Twitter for course mechanics (Clarke and Nelson 2012; Luo and Franklin 2015), but mixed perceptions exist when considering perceived learning outcomes as a result of using Twitter (McCorkle and Payan 2017). On the contrary, education represents the largest body of existing literature on Twitter usage for education purposes, from which a multitude of learning outcomes and activities related to the Twitter integration were reported and documented (Tang and Hew 2017). Therefore, comparing the communication classroom with an education classroom can provide established benchmarks for investigating communication majors' learning experiences and outcomes in adopting Twitter in classroom.

Mirroring the major pedagogical use of Twitter seen in the literature, we designed three instructional activities to explore Twitter's educational benefits in an education and a communication undergraduate course, namely, backchannel, exploring hashtags, and (course-related) topics discussion. With three activities being implemented in an identical manner, we aimed to examine the differences in students' perceptions of and participation in these Twitter-supported activities and how they may be influenced by any differences in pre-perceptions inherent in student usage patterns and behaviors. Using a comparative case study design, this study examined multiple sources of qualitative and quantitative data to provide a thorough understanding of student experiences as well as to reveal the potential reasons of individual differences in student perceptions of Twitter integration. We crafted the following research questions to guide this study:

RQ1 How did students' Twitter pre-perceptions and technology use in an education versus a communication course differ entering the Twitter experiment?

RQ2 How did students participate differently in two courses?

RQ3 How did students' experience of the Twitter-supported activities differ in two courses across the three instructional activities (backchanneling, exploring hashtags, topics discussion)?

Methods

Participants

This study utilized a comparative case study research design to examine the case via a multi-dimensional approach to analysis (Yin 2008). Comparable participants from an education and a communication course were purposefully selected as samples for this study. In the education class, participants were 24 college students aged 19–22 enrolled in a required course for pre-service teachers at a midwestern university whose grade year ranged from sophomores to seniors. The specific majors to which students belong included Early Childhood Education, Middle Childhood Education, Special Education, Physics Education, Pre-Specialized Studies, and Outdoor Recreation and Education. Among these students 17 (70.83%) were female and 7 (29.17%) were male. In the communication class, participants were 16 college students aged 19–22 enrolled in an elective course for communication majors at a midwestern university whose grade year ranged from sophomores to seniors. The particular majors to which students belong included Advertising, Public Relations, Journalism, TV Arts, and Sports Communication. Among these students 10 (62.5%) were female and 6 (37.5%) were male. Participants were promised anonymity and confidentiality, and the study was in accordance with and approved by IRB from both universities.

Instructional contexts

The education course was administered through a hybrid format, with the class meeting three times face-to-face and all remaining coursework being completed online over the period of a 14-week semester. The major purpose of this course was to acquaint students with technology applications commonly found in educational settings. The expected learning outcomes were that students will be able to use a wide variety of emerging Web 2.0 technologies to develop or enhance classroom instruction. Being one of the commonplace instances of Web 2.0 technologies, Twitter in this course served as a pedagogical tool to promote interaction among peers and the instructor, as well as engagement and reflection on the content. Other forms of class interactions included emails and face-to-face interactions.

The communication class was administered in a traditional face-to-face course format, which also spanned a 14-week semester. The main purpose was to supply students with the social media tools and knowledge for becoming critical media users and effective communication practitioners. The expected learning outcomes were to enable students to use different social media platforms for strategic communication purposes as well as to develop advanced social media plans. The instructor's lecture was the major in-class activity, with guest lectures and student

discussions being complementary learning activities. The students also worked in teams throughout the semester to generate social media plans for real-world clients. Therefore, students' engagement and reflections were strongly encouraged to establish an interactive discussion and well-rounded collaboration environment.

The overall pedagogical design of the Twitter integration in both courses aimed to: (a) formulate dynamic online discussions and collaborations among students via the facilitation of Twitter communication (e.g., backchanneling and course-related topic discussion); (b) help students gain professional resources and insights on the strategic usage of Twitter for networking and communication purposes (e.g., exploring hashtags); and (c) allow students to obtain hands-on experience of intensive usage of Twitter as a communication and/or educational tool. In light of the above goals, we designed three instructional activities, namely, (a) a backchannel, (b) exploring hashtags, and (c) topics discussion. Students were not required to use Twitter beyond what they were asked to do in those three activities. In order to maintain commensurability in both classes and minimize instructors' influence on student participation, instructors from both classes met to determine on the same approach regarding their involvement on Twitter; they both took a *discussion moderator's* role by managing the three activities and facilitating the discussions as needed.

Procedure

We implemented three activities—backchannel, exploring hashtags, and course-related topics discussion—throughout the two courses. First, Twitter was utilized as a digital backchannel to allow for simultaneous questions and comments during in-class lectures and student presentations allowing for peer feedback on the spot. Second, students were required to learn about Twitter's educational and professional use by exploring domain-specific Twitter hashtags. Education students were searching hashtags such as #edchat and #edtech pertaining to educators' professional interest, while communication students were searching for hashtags such as #SMchat and #ContentChat pertaining to communicators' and/or social media practitioners' professional interest. Third, students were asked to post tweets displaying their thoughts and reflections of course readings as an after-the-class assignment, further using Twitter to fuel discussions on content materials within the course and answering related question prompts provided by the instructor. One tweet per week was set as a minimum requirement for the students in both classes, but students were encouraged to chat with the instructor and the peers beyond those prescribed instructional activities.

Data collection and analysis

This study collected both quantitative and qualitative data with a mixed methods design. The survey collected quantitative and qualitative data with a mixture of closed and open questions. A mixed methods research design is a procedure for collecting, analyzing, and mixing both quantitative and qualitative research methods in a single study to understand a research problem (Creswell and Plano Clark 2011).

Mixed methods research can obtain more complete understanding from both quantitative and qualitative databases and can compare multiple levels of a phenomenon within one system (Creswell 2008). In our context, the mixed methods design is chosen because both types of data have equal value for understanding students' use of Twitter as a learning tool in classrooms.

Using the course-designated hashtags, participants' tweets were collected using Twitter API. Researchers used data crawling tools TAGS and TweetReach to collect tweets from the education and communication classes, respectively. An end-of-course survey was conducted to examine students' perceptions about their experience with the three types of Twitter-supported activities on a Likert Scale of 1–6. Questions were designed to help students reflect on each of the Twitter-supported activities, including (a) backchannel use during lectures and student presentations, (b) exploring hastags, and (c) discussing course-related topics. The statements were followed by an open-ended question asking students to justify their ratings by providing additional comments.

Table 1 shows various forms of data collected from two classes. In the education course, twenty-two out of the 24 total participants took the survey in the final face-to-face class meeting. Their average age was approximately 21 (N male = 6, N female = 10, Mage = 20.50, SD = 1.06). In terms of year in school, 50% of the education students were third-year students, 23% were fourth-year students and the same number were second-year students, while one of them was at his/her fifth year. In the communication course, 16 out of the 16 total participants completed the survey (N male = 6, N female = 10, Mage = 20.75, SD = .77). In terms of year in school, 50% of them were third-year students, 43.75% were fourth-year students, and 6.25% were second-year students.

To answer RQ1 (How did students' Twitter pre-perceptions and technology use in two courses differ entering the Twitter experiment?), three questions in the exit survey regarding to students' Twitter pre-perceptions, frequency of Twitter use, and technology use in general were asked, and the results were analyzed. To answer RQ2 (How did students participate differently in two courses?), we conducted a quantitative analysis of all the tweets posted by two classes during the semester. We used data from both self-reported survey and counted number of tweets captured by software programs to answer this question. Quantity of tweets was broken down by each individual activity. To answer RQ3 and understand students' experience across the three activities, we first used descriptive statistical analyses to compare means and standard deviations of the survey items and then conducted an independent *t* test to test the statistical differences between the two classes using SPSS 23. In analyzing data from open-ended questions, we grouped students' responses into two major categories: benefits and affordances versus drawbacks and challenges. Similarities and discrepancies of students' perceptions from the two majors were also crosschecked from the data.

Trustworthiness

In order to enhance trustworthiness, validity and credibility of the data, we employed triangulation as a primary validation strategy that involves gathering information from multiple sources and using multiple methods for research (Patton

Table 1 Various forms of data collected from two classes

	Education	Communication
Class size	24	17
Total # of tweets	414	579
Survey participants	22	16

2002). In this study, we used data from surveys along with open-ended questions, as well as students' tweets as artifacts of learning. Data from quantitative questions in the survey were validated by their responses to the open-ended questions, as well as actual tweets collected over the course of the semester. Instructors and researchers also took reflective notes and journals prior to and during the process of the data collection and analysis (Nastasi and Schensul 2005), ensuring transparency of researchers' own bias and assumptions and ultimately increasing the credibility and trustworthiness of the study. Additionally, we provided a *thick description* allowing readers interested in making a transfer to reach their own conclusion about whether or not transfer is possible (Lincoln and Guba 1985).

Results

Students' Twitter pre-perceptions and technology usage

Students were first asked about their Twitter pre-perceptions. A total of 41% of the education students considered themselves a proponent (e.g., I can see how Twitter can be used professionally or for educational purposes), 9% a skeptic (I doubt its educational and professional purpose), while half of them as neutral (e.g., I am in the middle of the road. I can see both its benefits and constraints). When it comes to communication students, 56.25% thought of themselves a proponent, 12.5% a skeptic, and 18.75% as neutral. In terms of the frequency of Twitter use, 23% of the education students considered themselves a newbie (e.g., I don't even have an account or I have an account but only have a few tweets), 45% a member (e.g., I have an account and I tweet or follow other people's tweets, but not too enthusiastic), and 32% a veteran (e.g., I tweet all the time, almost every day and I love it!). In terms of the communication students, a similar pattern emerged with 12.5% a newbie, 56.25% a member, as well as 31.25% a veteran.

This data shows that variation in individual's Twitter adoption is incredibly high in both groups of students. In the education classroom, a few students did not have a Twitter account and had never tweeted prior to this class, while contrastingly the most active tweeted almost on a daily basis. However, a majority (almost 60%) of the education students remained a neutral or skeptical attitude towards Twitter. Compared to their education peers, most communication students were more active Twitter users, and they manifested a more positive and clearer pre-perception towards Twitter's educational value. More than half of the communication students (56.25%) were aware of its educational and professional use prior to the class.

When asked about their technology use in general, communication students seemed to outdo their education peers. Approximately 18% of the education students considered themselves as an Advanced Beginner, 50% as Intermediate, 32% as Advanced, but no one considered themselves as a pure beginner or expert. In contrast, most of communication students identified themselves as an advanced user or expert. Approximately 6% of the communication students considered themselves as Expert, 69% as Advanced, 19% as Intermediate, and 6% as Advanced Beginner. None of them identified themselves as a beginner. Moreover, according to the surveys, the use of smartphones among education students was pervasive as 19 out of 22 of them owned a smartphone. Out of the 19 students, only two did not use Twitter on their smartphones. In the communication class, all 16 students owned a smartphone and used Twitter on phone. Table 2 provides a summary comparing students' pre-class usage pattern and pre-perceptions in two courses.

Students' participation in two classrooms

Our data in the self-reported survey showed that communication students overall presented a more active participation level compared to their education peers in terms of the number of course-related tweets sent out. Education students reported that they sent out approximately three tweets per week that were pertinent to the class (mean = 2.91, SD = 2.31), whereas in general they sent out 12 tweets in total (mean = 11.50, SD = 10.65), including those for social and recreational purposes. Communication students sent out approximately five tweets per week that were in relation to the course (mean = 4.5, SD = 3.92), and in general they sent out around

Table 2 Student pre-class usage patterns and pre-perceptions in two courses

Items	Types	Education (%)	Communication (%)
1. When it comes to pre-perception of Twitter use, I consider myself as	Proponent	41	56.25
	Skeptics	9	12.50
	Neutral	50	18.75
	No opinion	0	12.50
2. When it comes to frequency of Twitter use, I consider myself as	Newbie	23	12.50
	Member	45	56.25
	Veteran	32	31.25
3. As a technology user, I consider myself as	Beginner	0	0
	Advanced beginner	18	6.25
	Intermediate	50	18.75
	Advanced	32	68.75
	Expert	0	6.25

nine weekly (mean = 9.38, SD = 8.14), including both social and recreational tweets.

According to the numbers of tweets captured by the software programs, each communication student posted a total number of 34 tweets on average throughout the semester and education students posted 17. Communication students thus sent about twice number of the tweets sent out by education majors, based on the number of course-related tweets posted per person as a parameter. Particularly, communication students sent out more tweets than the education students did for the Exploring Hashtags and Backchanneling activities. Notably, for Backchanneling activity, communication students were highly active, tweeting in the face-to-face setting during class lectures and student presentations as a communication backchannel. They altogether posted 273 tweets, while their education peers only posted 107. Contrastingly, in Topics Discussion activities, education students posted 188 tweets, which is more than the 162 tweets sent by the communication class. Table 3 presents information about student participation in two courses.

Learning experience of the three Twitter-supported activities

Perception of Twitter use in the backchanneling activity

In both classes students' views on the Twitter integration in face-to-face classrooms as a backchannel were overwhelmingly positive (see Tables 4, 5). The ratings of face-to-face classroom Twitter use were consistently higher across all items during both lecture sessions and student presentations. Meanwhile, the standard deviations were lower, indicating homogeneity across each individual student's perception. The independent *t* tests showed that there is no significant difference of student perception between students in the education versus communication course across all items.

Our data suggested that the backchannel integration during the lecture sessions seemed to be beneficial to both education and communication students in that it allowed an alternative venue where students could reflect on their learning through posting reflective questions and actively interacting with the lecturer and classmates. During student presentations, Twitter was used to as a backchannel to provide peer feedback to each other. Akin to the backchannel integration during the lecture sessions, the Twitter use in student presentations was also highly favored by

Table 3 Student participation in two courses

	Education	Communication
1. # of course-related tweets per person	17.25	34.06
2. Exploring Hashtags	119	144
3. Topics discussion	188	162
4. Backchanneling	107	273

Table 4 Perceptions of Twitter use in the face-to-face setting during lectures

Items	Education		Communication		Sig
	Mean	SD	Mean	SD	*p*
The Twitter backchannel integration allowed me to effectively focus on learning the topic	4.91	.92	4.81	.98	.76
The Twitter backchannel integration allowed me to interact with my classmates	5.05	1.05	5.00	.73	.88
The Twitter backchannel integration allowed me to effectively express my own understanding	5.05	1.09	5.13	.50	.79
The Twitter backchannel integration allowed me to effectively construct my own learning	4.59	.96	4.75	.93	.61
The Twitter backchannel integration allowed me to effectively interact with the instructor/guest speaker(s)	5.36	.66	5.50	.63	.53

1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = somewhat agree; 5 = agree; 6 = strongly agree

Table 5 Perceptions of Twitter Use in the Face-To-Face setting during student presentations

Items	Education		Communication		Sig
	Mean	SD	Mean	SD	*p*
The Twitter backchannel integration allowed me to effectively focus on learning the topic	4.91	1.11	4.56	1.03	.33
The Twitter backchannel integration allowed me to interact with my classmates	5.14	.94	5.38	.62	.38
The Twitter backchannel integration allowed me to effectively express my own understanding	4.86	.94	5.00	.63	.62
The Twitter backchannel integration allowed me to effectively construct my own learning	4.73	1.03	4.75	.93	.95
The Twitter backchannel integration allowed me to effectively interact with the instructor	4.86	.99	5.13	.62	.36

1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = somewhat agree; 5 = agree; 6 = strongly agree

students. During lectures, both education and communication students rated "The Twitter backchannel integration allowed me to effectively interact with the instructor/guest speaker(s)" the highest item. In the vein, both student groups rated "The Twitter backchannel integration allowed me to interact with my classmates" the highest during student presentations.

Students' written comments demonstrated several reasons why they favored the backchannel integration. In the education class, one common theme is that students believed the backchannel integration during the lecture period allowed them to ask questions and provide comments without disrupting classroom regularities, enabling

a unique form of participation. More importantly, students believed it promoted active learning in which students were better focused on the learning content and engaged in cognitive information processing. As one student commented, "It enabled us to focus on the topic without having to remember or jot down our own questions, and encouraged us to participate. This made the learning more unique to us and encouraged student-driven learning." The social interaction enabled by the Twitter backchannel seemed to take student learning to a higher level, lending it to higher cognitive processing where students could reflect upon, express, and construct their own learning. Education students expressed more concerns about the issues in the student presentations. Three students argued that the comments that students provided on Twitter were devoid of depth, in the sense that critical and constructive feedback that students could take beyond the classroom seemed to be lacking. Two students also commented that it could be distracting and made it hard to focus on other groups' presentations.

In the communication class, students believed the primary benefit of using Twitter during lecture sessions was to enhance engagement and connections with classmates via understanding each other's thoughts in regards to the subject. As one student commented, "It was engaging in that I was able to see my classmates' thoughts, opinions, and questions as well as my own all in one location." Beyond that, students also mentioned the other merits of adopting Twitter to be (a) interacting with the instructor/guest speakers (e.g., asking questions on Twitter), (b) expressing one's own ideas ("while building off them based on those of other classmates"), and (c) focusing more on the course material. Furthermore, students praised the use of Twitter during student presentations for enabling them to be engaged in other groups' presentations at ease, and to receive real-time feedback and questions from peers. One student said, "Asking questions through Twitter can be easier than raising your hands in class." Communication students also discussed the drawbacks. First, tweeting during lectures could easily become a distraction to their focus on the actual class content, especially when tweeting was mandated by the instructor. One student stated, "I was more worried with trying to come up with questions to meet the requirements for the assignment, than I was focused on the speaker." Second, one student felt the tweets were lack of genuineness and quality and thus were not valuable to improve learning experience. Many of these perceived drawbacks echoed their education peers' views.

Perceptions of exploring hashtag activity

Overall, in both classes participants perceived a high value of participating in the Exploring Hashtag activity (See Table 6). Both education and communication students found themselves to be able to effectively construct their learning, express their understanding, and focus on learning the topics via participation. Also, both classes considered the activity as effective to facilitate interactions with classmates and/or the instructor, but gave a slightly lower rating to the interaction item compared to other items. Again, independent *t* tests showed that there is no significant difference of student perception across almost all items, except for "allowed me to effectively *focus on learning the topic*."

Table 6 Student perceptions of exploring hashtag activity

Items	Education		Communication		Sig
	Mean	SD	Mean	SD	*p*
The Explore Hashtags activity allowed me to effectively *focus on learning the topic*	4.86	.94	5.44	.63	.04
The Explore Hashtags activity allowed me to effectively *interact with my classmates*	4.64	1.05	4.75	.68	.71
The Explore Hashtags activity allowed me to effectively *express my own understanding*	4.77	1.11	5.19	1.05	.25
The Explore Hashtags activity allowed me to effectively *construct my own learning*	5.05	1.0	5.25	1.00	.54
The Explore Hashtags activity allowed me to effectively *interact with the instructor*	4.73	1.12	5.00	.73	.40

1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = somewhat agree; 5 = agree; 6 = strongly agree

Our data suggested that exploring hashtags, as an initial step in the process of learning Twitter's educational use, was highly regarded by both student groups. Students were primarily focused on reflecting on their own learning and processing new knowledge attained from the hashtags, which may have explained the relatively lower ratings on the rest of items pertaining to interactions both in and outside the class community. The higher rating on the *focus on learning the topic* item by communication students might have indicated communication students' advanced capability to be able to concentrate and locate the course-related topics amongst an extensive range of unrelated topics on Twitter due to their more avid use and familiarity of the platform compared to their education peers. However, as the same item was ranked the second highest by education students, we believe this significant difference can be negligible.

According to comments collected from open-ended questions, education students were able to search for more relevant information and resources on educational technology and learn the professional and academic use of Twitter through the Exploring Hashtag activity. Twelve out of 17 students who provided qualitative comments reported that this was their first time trying to search for an educational hashtag and learning Twitter's professional use. They were reported to have gained information that they would not have had without exploring hashtags. Among those who had scarce Twitter experience, this activity was particularly mind-blowing and eye-opening. As one student put it, "The hashtag exploration was beneficial for me because I hadn't previously used Twitter. It helped me learn to navigate the site and exposed me to many professional resources on Twitter. Without this, I probably would have been less receptive to the idea that Twitter can be used professionally." Another student commented that even though he knew how hashtags worked, he was unaware that there were hashtags that could connect them to educational communities. In contrast, avid users found this activity less intriguing. As one

students noted, "I already understood the concept of a hashtag so it was something that I already knew how to do."

In the communication course, similar to patterns seen in the education class, a majority of students believed that exploring hashtags was eye-opening as they previously "didn't know that such chats existed." Students agreed on the positive educational experience gained from the activity. They believed that they had learned valuable knowledge, specifically, in regards to (a) the professional usage of Twitter and hashtags (e.g., "Exploring the hashtags was a new experience for me and furthered my understanding of Twitter"), (b) the online conversations among different businesses (e.g., "I got a chance to understand the process of innovation that happens on Twitter with different businesses"), and (c) the communication/social media marketing industry (e.g., "I felt that I found new resources to go to in order to learn more about the industry that I am interested in"). Students particularly stressed that the Exploring Hashtag activity helped them to express personal opinion as well as to build real-world connections with industry professionals. For instance, one student stated, "receiving responses from actual professionals within the chat was very cool." Only one student out of the 16 questioned the educational value of exploring hashtags. He said, "it allowed me to get a feel for one of the aspects of Twitter. However other than that, I am not sure what else I learned from it."

Perceptions of topics discussion activity

As with the previous activities, in both classes students overall favored the use of Twitter in discussing course-related topics according to the high ratings (see Table 7). The first item, focusing on learning the topic, received the highest rating by education students, while communication students rated "allowed me to effectively express my own understanding and interact with the instructor" equally

Table 7 Student perceptions of topics discussion activity

Items	Education		Communication		Sig
	Mean	SD	Mean	SD	*p*
The topics discussion activity on Twitter allowed me to effectively deepen my understanding of the discussion topic	4.64	1.18	5.06	.85	.23
The topics discussion activity on Twitter allowed me to effectively interact with my classmates	4.59	1.18	5.06	.93	.19
The topics discussion activity on Twitter allowed me to effectively express my own understanding	4.45	1.14	5.19	.66	.03
The topics discussion activity on Twitter allowed me to effectively construct my own learning	4.55	1.14	5.12	.72	.08
The topics discussion activity on Twitter allowed me to effectively interact with the instructor	4.45	1.22	5.19	.75	.04

1 = strongly disagree; 2 = disagree; 3 = somewhat disagree; 4 = somewhat agree; 5 = agree; 6 = strongly agree

the highest. These two items also displayed a significant difference between the two groups of students.

In the education class, based on the ratings, the students' perceived Topics Discussion activity less favorably than the Exploring Hashtag activity. This might have been due to the loss of novelty effect of using Twitter throughout the semester. The highest rated item, *focusing on learning the topic*, may have suggested that the use of Twitter provides an effective tool with which students can use to engage with useful content knowledge. In the communication class, students' two highest rated items suggested that Twitter allowed them to express their own understanding and interact with the instructor. The significant difference between two classes again may be explained by their prior use and perception; two course instructors' degree of involvement during this activity varied which might have also caused such difference.

According to the open-ended comments, education students stated the overall benefits of having discussion over course-related topics as well as some perceived challenges. Of the 16 students who commented, 13 tended toward favoring the activity because of the improved student interaction. One student commented that it allowed the students to interact outside of the classroom effectively. As one student put, "it was somewhat beneficial because I was able to talk to other students who I did not know and who I never talked to which make it exciting to receive a tweet and see what that student had to say. It was nice to discuss with other classmates." Students also believed it helped work their way into the live chats. Noticeably, some students, in reverse, doubted the authenticity of such interaction. Two students pointed out that the tweets seemed forced instead of thoughtful. These skeptical viewpoints were previously seen in the communication students' comments during backchannel activity.

In the communication class, students were passionate about participating in this type of activities, because it forced them to "think critically about the subject matter." Notably, students' enjoyment and satisfaction were directly associated with particular topics discussed. For example, one discussion topic was "best time to post on social media," and a student clearly recalled it in the comment, "I really enjoyed the 'best time to post on social media' discussion and document. I think that was probably the most interesting topic discussed this semester." Similarly, another student explained his/her favorability toward a topic relating to a documentary watched in the class, "This was a great experience because this documentary is all about how our generation responds to technology and social media. I was able to interact with social media and respond to this documentary via social media platforms, which deepened my understanding about the topic." Therefore, the selection of discussion topics is of great significance to the success of the activity, and a good topic was considered as both relevant and allowing room for various opinions.

Discussion

Considering the education and the communication classrooms, we found that both classes manifested an overall positive perception toward the integration of Twitter alongside active participation. Students in both classes possessed a favorable predisposition towards the usage of Twitter, suggesting the appropriateness and need to incorporate Twitter in college students' learning processes. Comparing the two majors, our results revealed that the communication students perceived Twitter as a more beneficial tool for professional purposes than the education students. The communication class reported a more frequent use of Twitter as part of their daily routine, and they were more likely to identify themselves as an expert or advanced technology user, thus surpassing the education class. Consequently, the communication class showed a higher participation pattern, publishing more tweets on average than the education class, especially during the backchanneling and exploring tweets activities. These findings may suggest that the group of education students tended to be somewhat more conservative towards the use of technology compared to the communication peers. Such results concur with prior studies, indicating that many education students who are pre-service teachers tend to be overly concerned with the risks and drawbacks of using technology, therefore becoming relatively slow in adopting new technologies and integrating technologies into classrooms (Allsopp et al. 2009; Vannatta et al. 2001; Wang 2002). The negativity and ignorance, both attitudinal and behavioral, towards technology still seems to exist in the new-generation of pre-service teachers in this study.

Perceptions of the three instructional activities in two classrooms

Both classes recognized multiple benefits of using Twitter in face-to-face classrooms as a *backchannel*. Students in general believed such usage created a unique form of class interaction, enabling them to ask questions and receive feedback in real-time via a non-distracting manner. Using Twitter as a question forum allowed for more clarification and elaboration as both peers and instructors responded to questions posted on Twitter, and the responses in turn deepened students' understanding of the topic, therefore strengthening their knowledge construction process. Communication students seemed to view the backchannel activity more favorably, potentially due to their higher pre-class Twitter usage pattern. In terms of the challenges of using Twitter as a backchannel, both student groups considered it to be somewhat distracting and devoid of quality. This may be explained by the fact that students were so preoccupied by the front-channel learning tasks that little remaining attention could be spared on initiating interactions with one another on Twitter. Concurring with cognitive load theory (Sweller and Chandler 1994), students were overloaded by information presented to them from the front-channel so that they did not have sufficient cognitive ability to process more from the backchannel. Due to distraction and information overload, students may find it difficult to simultaneously provide high quality feedback on Twitter along with engaging in other classroom tasks, which reconfirms the critical

role of instructional guidance and scaffolding in a microblogging-based learning environment (Holotescu and Grosseck 2009; Luo and Gao 2012).

Our survey results showed that both the education and communication classes perceived the *Exploring Hashtag* activity as an initial step towards a comprehensive grasp of Twitter as an educational and professional learning mechanism, as well as a helpful means to seek information from varying sources. The communication students seemed to take a more advantageous use of exploring hashtags, being able to process new knowledge from hashtags more easily compared to their education peers. Although both student groups agreed that they learned to better navigate the Twitter platform and understand how hashtags work, the communication class focused more on practicing the applications of hashtags to engage with professional resources, such as participating in the online dialogues among industry players, building real-world connections with professionals, and engaging with professional communities. Also, in both classes a majority of the students enjoyed the novelty of exploring hashtags, but a small portion who were avid users of hashtags expressed their disinterest in the activity. Such results again confirmed communication students' more favorable predisposition toward Twitter and its potential impact on their perception and experience (Lewis 2010; Luo and Franklin 2015; Luo et al. 2017).

The *Topics Discussion* activity is a form of asynchronous discussion-based activity intended to engage students in in-depth and interactive discussions where they can reflect on learning topics, elaborate on those topics, negotiate their meanings and ultimately construct or co-construct knowledge together with peers and instructors. Our survey data revealed that education students primarily focused on learning the course-related topics, whereas communication students concentrated more on expressing their own understanding and interacting with the instructor. The open-ended responses indicated that education students expressed feelings and concerns over the notion of social presence. As with many prior research studies (Dunlap and Lowenthal 2009; Kop 2011; Lomicka and Lord 2012), both student groups in general believed that they felt a sense of connectivity being on Twitter with their peers. Although the discussion on Twitter may fall short in terms of the depth of content, the sheer fact that students all congregated in a common and familiar social network to converse with one another and discuss learning topics seems to motivate and appeal to many students. Students commented that the discussions on Twitter invite more participation because students with reserved characters are more likely to speak up and voice their thoughts as well as feel more comfortable with their peers, which establishes a strong community within the classroom and encourages students to be proactive about their education. Such benefits were reported repeatedly in prior studies (Dunlap and Lowenthal 2009; Gao et al. 2012; Tang and Hew 2017).

Pedagogical implications and recommendations

We recommend that instructors and educational practitioners take students' prior usage patterns and behaviors into consideration when implementing Twitter-supported activities. As commonly seen in the results across all instructional

activities in this study, students' perception and participation in class is often associated with their pre-class usage patterns and perceptions. This is especially true for communication students who may have been long-time avid users for networking and socializing purposes; it is even more important to identify what their previous attitudinal and behavioral patterns are to better steer the direction of the Twitter activities in class (Blankenship and Gibson 2016). It is noted that some may have been averse to Twitter's educational use initially as they are reluctant to adjust their habitual use, but most will quickly adapt as soon as they are educated and understand the educational benefits. Generally, for education students who may often be newbies in the social media or technology use sphere (Allsopp et al. 2009; Vannatta et al. 2001; Wang 2002), it may require additional time and preparation to orient students into using Twitter for academic purposes in the classroom. Providing basic training to explain and practice the mechanism of hashtags and other Twitter functionalities would be an adequate warm-up task before taking on the three major instructional activities.

The design of the instructional activities should also suit the knowledge domain and content area, as well as help students perceive relevance to their career preparation. For the topics discussion activity specifically, we recommend instructors to select discussion topics that are of high relevance to students' career preparation and that allows room for varying opinions and critical thinking. Students tend to view the activity more favorably and therefore participate more actively if they can identify relevance. This recommendation is in alignment with Keller's (1987) classic motivation model where relevance is critically emphasized, as meeting the needs of the learner results in making the learning process more relevant to them. Demonstrating the relevance of learning, whether academic, personal or professional, often results in a higher motivational level and engagement in students. When incorporating Twitter, instructors may consider having students address their previous experiences, the value and future use of learning the content, and how it meets the learner's needs with the instruction. In particular, education instructors may suggest that students follow leaders in education and participate in educational live chats, whereas communication instructors may ask students to conduct an observation and report on how industrial leaders use Twitter for advertising, public relations, journalism practices and so on.

Conclusion

Extant literature highlights the importance of improving social media-supported learning environments (Greenhow et al. 2009; Tang and Hew 2017). Our study adds to the existing literature on social media in education by providing a comparative analysis of students' varying experiences engaging with Twitter in two unique undergraduate classrooms. Our findings proffer insights into how students may respond to the same Twitter classroom integration activities to a varying degree according to their differences in pre-class perceptions and behavioral patterns. Using a comparative case study, our data suggests that education and communication students might possess discrete characteristics in terms of social media usage,

which may warrant a corresponding differentiation for instructors providing and designing instructional strategies and methods. We also provide pedagogical implications and recommendations for instructors intending to apply or replicate the three instructional activities employed in this study.

We recommend future researchers to continue efforts in this area, advancing the understanding of the differences and similarities of students' experience with social media integration from different backgrounds and across diverse disciplines. As our study was conducted in a semester-long timeframe, we were unable to capture students' cognitive and developmental changes that are typically manifested over a long period of time. Future research may consider such directions conducted a longitudinal study, which can make showing the long-term effects of Twitter or an experimental design comparing perceptions and behavioral patterns of two student bodies in a more rigorous manner possible. In addition to making cross-disciplinary comparisons, we also recommend making comparisons across different age groups and academic levels, such as between traditional undergraduate and graduate/doctoral student bodies, as prior research showed that Twitter integration might be more conducive to upper-class and graduate courses, for they possess a more mature student body (Cronin 2011).

Also, we did not explore the specific types and volume of Twitter conversations that the communication and educational student engaged in on a regular basis, which might provide a meaningful perspective to interpret the differences of the two groups' use of Twitter in class-room settings. A future study can examine the impact of students' characteristics of their regular, personal Twitter usage on their use of Twitter in classrooms.

Moreover, using a case study design, we did not attempt to tease out historical or extraneous factors that may have contributed to the difference in student perception and participation. We believe advanced research designs and methodologies, as well as investigations into a diverse representation of varying student bodies will provide further insights and guidance in improving social media-supported learning environments in higher education.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Informed consent Informed consent was obtained from all individual participants included in the study. The study done in the education class was approved by Office of Research Compliance from Ohio University and done in the communication was approved by Office of Research from Bradley University.

References

Allsopp, D. H., Alvarez McHatton, P., & Cranston-Gingras, A. (2009). Examining perceptions of systematic integration of instructional technology in a teacher education program. *Teacher Education and Special Education, 32*(4), 337–350.

Auger, G. A. (2013). Fostering democracy through social media: Evaluating diametrically opposed nonprofit advocacy organizations' use of Facebook, Twitter, and YouTube. *Public Relations Review, 39*(4), 369–376.

Awad, N. I., & Cocchio, C. (2015). Use of twitter at a major national pharmacy conference. *American Journal of Health System Pharmacy, 72*(1), 65–69. https://doi.org/10.2146/ajhp140175.

Barnes, N. G., & Griswold, J. (2016). *Use of popular tools remains constant as use of Instagram expands quaickly among the 2016 Fortune 500*. Retrieved from http://www.umassd.edu/cmr/socialmediaresearch/2016fortune500/.

Blankenship, J. C., & Gibson, R. (2016). Learning alone, together: Closed-cohort structure in an online journalism and mass communication graduate program. *Journalism and Mass Communication Educator, 71*(4), 425–439.

Blessing, S. B., Blessing, J. S., & Fleck, B. K. B. (2012). Using Twitter to reinforce classroom concepts. *Teaching of Psychology, 39*(4), 268–271.

Borau, K., Ullrich, C., Feng, J., & Shen, R. (2009). Microblogging for language learning: Using twitter to train communicative and cultural competence. In *Advances in web based learning—ICWL 2009* (pp. 78–87).

Brito, M. (2011). *Smart business, social business: A playbook for social media in your organization*. London: Pearson Education.

Carpenter, J. P., & Krutka, D. G. (2014). How and why educators use Twitter: A survey of the field. *Journal of Research on Technology in Education, 46*(4), 414–434.

Chun, D., Kern, R., & Smith, B. (2016). Technology in language use, language teaching, and language learning. *The Modern Language Journal, 100*(S1), 64–80.

Clarke, T. B., & Nelson, C. L. (2012). Classroom community, pedagogical effectiveness, and learning outcomes associated with Twitter use in undergraduate marketing courses. *Journal for Advancement of Marketing Education, 20*(2), 29–38.

Crawford, E. C., Fudge, J., Hubbard, G. T., & Filak, V. F. (2013). The mass comm type: Student personality traits, motivations, and the choice between news and strategic communication majors. *Journalism and Mass Communication Educator, 68*(2), 104–118.

Creswell, J. W. (2008). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research* (3rd ed.). Upper Saddle River, NJ: Pearson Education.

Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd ed.). Thousand Oaks, CA: Sage.

Cronin, J. J. (2011). The classroom as a virtual community: An experience with student backchannel discourse. *Business Education Innovation Journal, 3*(2), 56–65.

de Waard, I., Abajian, S., Gallagher, M. S., Hogue, R., Keskin, N., Koutropoulos, A., & Rodriguez, O. C. (2011). Using mLearning and MOOCs to understand chaos, emergence, and complexity in education. *The International Review of Research in Open and Distance Learning, 12*(7), 94–115. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1046/2026.

Diaz-Ortiz, C., & Stone, B. (2011). *Twitter for good: Change the world one tweet at a time*. San Francisco, CA: Jossey-Bass.

Dunlap, J. C., & Lowenthal, P. R. (2009). Tweeting the night away: Using Twitter to enhance social presence. *Journal of Information Systems Education, 20*(2), 129–155.

Elavsky, C. M., Mislan, C., & Elavsky, S. (2011). When talking less is more: Exploring outcomes of Twitter usage in the large-lecture hall. *Learning, Media and Technology, 36*(3), 215–233. https://doi.org/10.1080/17439884.2010.549828.

Gao, F., Luo, T., & Zhang, K. (2012). Tweeting for learning: A critical analysis of research on microblogging in education published in 2008–2011. *British Journal of Educational Technology, 43*(5), 783–801.

Garrison, D. R., & Arbaugh, J. B. (2007). Researching the community of inquiry framework: Review, issues, and future directions. *The Internet and Higher Education, 10*(3), 157–172.

Greenhow, C., Robelia, B., & Hughes, J. E. (2009). Learning, teaching, and scholarship in a digital age: Web 2.0 and classroom research: What path should we take now? *Educational Researcher*, *38*(4), 246–259.

Greenwood, S., Perrin, A., & Duggan, M. (2016, November 11). *Social media update 2016*. Retried from http://www.pewinternet.org/2016/11/11/social-media-update-2016/.

Holotescu, C., & Grosseck, G. (2009). *Using microblogging in education. Case study: Cirip.ro*. Paper presented at the 6th Conference on e-Learning Applications, Cairo, Egypt. Retrieved from http://www.scribd.com/doc/8551345/Using-microblogging-in-education-Case-Study-Ciripro.

Hsu, Y. C., & Ching, Y. H. (2012). Mobile microblogging: Using Twitter and mobile devices in an online course to promote learning in authentic contexts. *The International Review of Research in Open and Distance Learning, 13*(4), 211–227.

Java, A., Song, X., Finin, T., & Tseng, B. (2007). Why we Twitter: Understanding microblogging usage and communities. In *Proceedings of the 9th WebKDD and 1st SNA-KDD 2007 workshop on web mining and social network analysis, WebKDD/SNA-KDD'07* (pp. 56–65). New York, NY: ACM.

Keller, J. (1987). Development and use of the ARCS model of instructional design. *Journal of Instructional Development, 10*(3), 2–10.

Kop, R. (2011). The challenges to Connectivist learning on open online networks: Learning experiences during a massive open online course. *The International Review of Research in Open and Distance Learning, 12*(3), 19–38. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/882/1689.

Kop, R., Fournier, H., & Mak, J. (2011). A pedagogy of abundance or a pedagogy to support human beings? Participant support on massive open online courses. *The International Review of Research in Open and Distance Learning, 12*(7), 74–93. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1041/2025.

Lewis, B. K. (2010). Social media and strategic communication: Attitudes and perceptions among college students. *Public Relations Journal*, 4(3). Retrieved from http://furooshgah.ir/wp-content/uploads/2016/12/Social-Media-and-Strategic-Communication.pdf.

Lincoln, Y. S., & Guba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

Lomicka, L., & Lord, G. (2012). A tale of tweets: Analyzing microblogging among language learners. *System, 40*(1), 48–63. https://doi.org/10.1016/j.system.2011.11.001.

Luo, T. (2015). Instructional guidance in microblogging-supported learning: Insights from a multiple case study. *Journal of Computing in Higher Education, 27*(3), 173–194.

Luo, T. (2016). Enabling microblogging-based peer feedback in face-to-face classrooms. *Innovations in Education and Teaching International, 53*(2), 156–166.

Luo, T., & Franklin, T. (2015). Tweeting and blogging: Moving towards education 2.0. *International Journal on E-Learning, 14*(2), 235–258.

Luo, T., Franklin, T., Moore, D., & Crompton, T. (2017). *Applying a modified technology acceptance model to qualitatively analyze the factors affecting microblogging integration*. Manuscript submitted for publication.

Luo, T., & Gao, F. (2012). Enhancing classroom learning experience by providing structures to microblogging-based activities. *Journal of Information Technology Education: Innovations in Practice, 11,* 199–211.

McCorkle, D., & Payan, J. (2017). Using Twitter in the marketing and advertising classroom to develop skills for social media marketing and personal branding. *Journal of Advertising Education, 21*(1), 33–43.

McNely, B. (2009). *Backchannel persistence and collaborative meaning-making*. In Proceedings of the 27th ACM international conference on design of communication (pp. 297–304). ACM.

McWilliams, J., Hickey, D. T., Hines, M. B., Conner, J. M., & Bishop, S. C. (2011). Using collaborative writing tools for literary analysis: Twitter, fan fiction and the crucible in the secondary English classroom. *Journal of Media Literacy Education, 3*(3), 238–245.

Nastasi, B. K., & Schensul, S. L. (2005). Contributions of qualitative research to the validity of intervention research. *Journal of School Psychology, 43,* 177–195.

Ojeda-Zapata, J. (2008). *Twitter means business: How microblogging can help or hurt your company*. Silicon Valley: Happy About.

Patton, M. Q. (2002). *Qualitative research and evaluation methods*. Thousand Oaks, CA: Sage.

Pauschenwein, J., & Sfiri, A. (2010). Adult learner's motivation for the use of microblogging during online training courses. *International Journal of Emerging Technologies in Learning, 5*(1), 22–25. https://doi.org/10.3991/ijet.v5i1.1041.

Perifanou, M. A. (2009). Language micro-gaming: Fun and informal microblogging activities for language learning. *Communications in Computer and Information Science, 49,* 1–14.

Sinnappan, S., & Zutshi, S. (2011). Using microblogging to facilitate community of inquiry: An Australian tertiary experience. *Paper presented at the 28th Australasian society for computers in learning in tertiary education conference*. Retrieved from https://www.learntechlib.org/p/43666/.

Smith, J. (2009). *Dominate your market with Twitter: Tweet your way to business success*. Oxford: Infinite Ideas Limited.

Sparks, D. (2017). *How many users does twitter have?* Retrieved from https://www.fool.com/investing/2017/04/27/how-many-users-does-twitter-have.aspx.

Stirland, S. (2008). *The Obama campaign: A great campaign, or the greatest?* Retrieved from http://www.wired.com/threatlevel/2008/11/the-obama-campa/.

Sweller, J., & Chandler, P. (1994). Why some material is difficult to learn. *Cognition and Instruction, 12,* 185–233.

Tang, Y., & Hew, K. F. (2017). Using Twitter for education: Beneficial or simply a waste of time? *Computers and Education, 106,* 97–118.

Vannatta, R., Beyerbach, B., & Walsh, C. (2001). From teaching technology to using technology to enhance student learning: Preservice teachers' changing perceptions of technology infusion. *Journal of Technology and Teacher Education, 9*(1), 105–127.

Veletsianos, G., & Kimmons, R. (2016). Scholars in an increasingly open and digital world: How do education professors and students use Twitter? *The Internet and Higher Education, 30,* 1–10.

Wang, Y. (2002). When technology meets beliefs: Preservice teachers? Perception of the teacher's role in the classroom with computers. *Journal of Research on Technology in Education, 35*(1), 150–161.

Yin, R. K. (2008). *Case study research: Design and methods*. Thousand Oaks, CA: Sage.

Tian Luo is an Assistant Professor of Instructional Design & Technology program at Old Dominion University. Formerly, she had worked as an instructional design professional in both higher education and corporate settings. She currently serves as a co-editor of Journal of Information Technology Education: Research & Journal of Information Technology Education: Innovations in Practice. Her research interests center on using social media to facilitate student learning and designing collaborative and authentic learning environments supported and enhanced by emerging web-based technologies.

Quan Xie is an Assistant Professor of Strategic Communication in the Slane College of Communications and Fine Arts at Bradley University. She earned her Ph.D. in Mass Communication from Ohio University. Her research interests center on new emerging media technologies and strategic communication. She is one of the grant recipients of the 2017 American Academy of Advertising (AAA) Research Fellowship Grants. She has published scholarly articles in peer-reviewed journals, such as, Journal of Current Issues and Research in Advertising and International Journal of Strategic Communication.