9-2012

Tweeting for Learning: A Critical Analysis of Research on Microblogging in Education Published in 2008-2011

Fei Gao
Bowling Green State University, gaof@bgsu.edu

Tian Luo
Ohio University - Main Campus

Ke Zhang
Wayne State University

Tweeting for Learning: A Critical Analysis of Research on Microblogging in Education Published in 2008-2011

Fei Gao

Tian Luo

Ke Zhang

Fei Gao is an Assistant Professor in Learning Design at Bowling Green State University. Her research focuses on designing technology-enhanced learning environments and assessing the effectiveness of these environments. Address: 10257 Desmond Place, Perrysburg, Ohio, 43551. Email: gaof@bgsu.edu.

Tian Luo is a doctoral student in the Department of Educational Studies at Ohio University. Her research interests centre on using social media and social technologies to facilitate student learning in formal and informal educational settings. Email: tl303308@ohio.edu.

Ke Zhang is an Associate Professor in the College of Education at Wayne State University in the United States. Address: 385 Education, 5425 Gullen Mall, Detroit, MI, 48202, USA. Email: bb2145@wayne.edu

Abstract: This study critically analyzed the current body of published research on microblogging in education (MIE) to build a deep and comprehensive understanding of this increasingly popular phenomenon. Twenty-one studies on MIE in 2008-2011 were selected based on the selection criteria and analyzed to answer the following questions: (a) What types of research have been published on MIE? (b) How was microblogging used for teaching and learning in these studies? (c) What educational benefits did microblogging have on teaching and learning? and (d) What suggestions and implications did the current research have for future MIE research and practices? The analysis suggested that microblogging has a potential to encourage participation, engagement, reflective thinking as well as collaborative learning under different learning settings. The quality of research, however, varies greatly, suggesting a need for rigorous research on MIE. The analysis has implications for MIE practices as well as research and development efforts.

Tweeting for Learning: A Critical Analysis of Research on Microblogging in

Education Published in 2008-2011

Microblogging has become an increasingly popular phenomenon since Twitter was launched in 2006. Microblogging allows users to publish and share brief updates for real-time and asynchronous communication with no more than 140 characters. Users may explore, follow, reply or forward each other's posts. In this way, interactions and collaborations can take place among people from virtually any corner of the world (Java, Song, Finin, & Tseng, 2007). Although interactions via microblogging are often informal or sometimes playful (Dunlap & Lowenthal, 2009), many scholars believe that microblogging has great potential of promoting learning. With microblogging, resources can be shared instantly among learners, and instructors can exchange ideas with students in a prompt fashion (Click & Petit, 2010; Hansen, 2011; Paz, 2009; Thames, 2009). Microblogging, therefore, promotes a collaborative virtual learning environment.

Despite the enthusiasm in educational microblogging, relevant research is rather limited. Existing studies on microblogging in education (MIE) vary remarkably in terms of educational contexts, learning activities, and assessments. A comprehensive and critical review of published research is much needed to build a deep understanding of MIE as well as to guide future research and practices.

Research Questions

This study critically analyzed the research on MIE to answer the following research questions:

1. What types of research were conducted on MIE?

2. How was microblogging used for teaching and learning in these studies?

3. What educational benefits did microblogging have on teaching and learning as identified in these studies?

4. What suggestions and implications did the current research have for future MIE research and practices?

Method

Selection Criteria

To answer the research questions, a set of selection criteria were established and followed strictly:

1. Research must focus on microblogging in educational settings. Published research on microblogging in media studies, cultural studies, or political studies were thus excluded;

2. Research must be empirical studies reporting data derived from actual observations or experimentations. Articles that were solely based on personal opinions or anecdotal experiences were excluded. Theoretical and conceptual pieces were also excluded from the content analysis, but were carefully reviewed to strengthen our background knowledge and to broaden the theoretical foundation for developing a general understanding of MIE;

3. Research must evaluate the microblogging-based activities by reporting qualitative or quantitative data in one or more of the following dimensions of learning: learning efficiency (i.e. whether learners learn with less time or effort); learning outcomes (i.e. whether learners learn more or better); convenience (i.e. whether learners have easier access to learning) and motivation (i.e. whether

learners are more engaged in the learning processes). Articles that did not provide any evidence on the above four dimensions were excluded.

Identification of Eligible Studies

Relevant research was retrieved through a series of search efforts, and eligible research meeting the selection criteria was identified. The search was carried out in four phases. First, we conducted a search in 22 major refereed academic journals in educational technology using the keyword "microblogging" or "Twitter". These journals were: *American Journal of Distance Education*, *British Journal of Educational Technology, Computers and Education, Computers in Human Behavior, Distance Education, Educational Technology Research and Development, Educational Technology and Society, Innovations in Education and Teaching International, Instructional Science, Interactive Learning Environments, Internet and Higher Education, Journal of Asynchronous Learning Network, Journal of Computer Assisted Learning*, *Journal of Educational computing research, Journal of Interactive Learning Research, Journal of Technology and Teacher Education, Learning and Instruction, Learning, Media and Technology, The European Journal of Open, Distance and E-Learning*, *The International Journal of Education and Development using Information and Communication Technology, The International Review of Research in Open and Distance Learning,* and *Open Learning: The Journal of Open and Distance Learning*. As of August 2011, the search of the above journals yielded approximately fifty results, among which, seven met the selection criteria.

The second round of search was extended to three major educational databases, Educational Research Information Center (ERIC), Education Research Complete (ERC),

and Education Full-Text, using the same key words. This search yielded 69 records, and seven more articles meeting the selection criteria were identified and included for further analysis.

A third round of search was conducted on Google Scholar to further expand the pool. Key word searches were conducted using "Twitter" or "microblogging" in combination with "learning" or "education" (e.g., "twitter" + "learning" or "microblogging" + "education"). The first ten pages of results of each combined keyword search (approximately 400 results in total) were reviewed, and five eligible articles were identified.

Finally, snowball sampling was conducted by examining related articles cited in these 19 papers. Two more articles were found and added to the existing pool. As a result, 21 articles published in 2008-2011 were included for the analyses, and 17 of them were refereed articles. Figure 1 illustrates the four phases of search.

- insert Figure 1 here -

Analysis of Studies

The majority of the selected studies did not report sufficient statistical information for a meta-analysis. The nature of the research questions also require a descriptive approach. Therefore, a content analysis was conducted in three phases. During the first phase, we analyzed each study for the following characteristics: settings, participants, sample size, duration of intervention, educational practices (i.e. educational goals and educational activities), research types, data types, and educational effects. A preliminary table was generated at the end of the first phase of analysis (see Appendix 1). We further categorized the research articles by different settings (i.e., conferences, K-12, and higher

education), learning topics (i.e., language, instructional technology/design, new media, business, and others), sample sizes (i.e., <10, 10-50, 51-100, 101-150, and >150), duration of intervention (i.e., <1day, 1-8 weeks, 9-15 weeks, and >15 weeks), and data types (i.e., number of posts, examples of posts, categories of posts, surveys/interviews, academic grades and others), and summarized the results in Tables 1-5.

The second phase focused on identifying the common themes of educational practices and educational effects across the 21 studies. Two researchers independently coded the studies for themes, and then discussed the possible themes until they reached consensus. The identified themes of educational practices were: a) enabling immediate participation, b) inviting virtual participation, c) documenting ongoing processes, d) sustaining interaction and communication, e) expanding learning content, f) fostering interactive activities, and g) encouraging informal learning. The themes of educational effects were: a) learning community, b) participation and engagement, c) reflective thinking, and d) collaborative learning.

In the third phase, we identified the challenges and suggestions for MIE in the 21 studies. The types of challenges and suggestions were presented and discussed in detail in the results section.

When analyzing the studies, one noticeable problem was the lack of sufficient information reported in the articles. In a few studies, for example, sample sizes were not reported, and participants and settings were not clearly described (See Tables 2-4). Some other studies failed to provide details on how microblogging was integrated, how learners were expected to use the microblogging tools or how the instructor supported the

microblogging-based activities. Our analysis was conducted based on the information that was presented in these studies.

Results

A review of the 21 papers reveals that microblogging has been used to facilitate well-structured formal learning activities as well as to support a more digitalized, flexible and free-mode of learning beyond the classroom (Greenhow, Robelia, & Hughes, 2009). This section discusses the characteristics of the research studies, how microblogging was integrated in educational settings, and the reported educational effects and challenges.

Characteristics of the Research Studies

Data derived from the first phase of analysis revealed the characteristics of MIE research in terms of settings and participants, sample size, duration of intervention, and research type and data type.

Settings and participants

As indicated in Table 1, two of the studies explored how conference attendees used microblogging in conferences, and one was about students learning literacy in K-12 settings. The majority of the studies (18 out of 21) examined microblogging integration in higher education. Four were in language classes, and the rest of the studies were mainly conducted in social science classes on the topics of instructional design, new media, marketing and so on (See Table 2).

- insert Table 1 here-

- insert Table 2 here-

Sample size

Three studies did not report the sample size. The sample sizes of the rest 18 studies varied greatly, ranging from 8 to 1641 (see Table 3). Among them, 7 studies had a sample size of less than 50, and 10 studies over 100.

- insert Table 3 here-

Duration of intervention

Except for two studies that did not provide such information, the duration of intervention varied from about an hour to two semesters (See Table 4). The use of microblogging during conferences was usually limited by the length of the conferences or presentations. The duration was 74 minutes in one study and 9 days in the other study. Eight of the studies that conducted in higher education lasted no more than eight weeks, seven studies lasted 14 to 15 weeks, and the other two studies lasted two semesters.

- insert Table 4 here-

Research type and data type

Among the 21 studies, only one was an experimental study. The rest 20 were descriptive studies that were aimed at finding out "what is" and involved gathering data that describe events (Knupfer & McLellan, 1996). There were mainly three types of data collected across the studies: number of microblogging posts, content of posts, and survey or interview responses (see Table 5). More specifically, the number of posts was examined in 14 studies. Five studies provided selected examples of posts, and six conducted content analysis by coding the posts into thematic categories. Only one of the six studies (Elavsky, Mislan, & Elavsky, 2011), however, checked the intercoder reliability. Surveys or interviews were conducted in 15 studies, among which, only one study (Lowe & Laffey, 2011) reported the survey reliability. Data presented in some

studies were very limited. For example, three studies only reported the number of posts, and one study was purely based on observation and selected examples of tweets (see Appendix 1).

- insert Table 5 here-

Educational Practices

An analysis of the educational practices (educational goals and educational activities) across studies revealed how educators and researchers integrated microblogging to achieve different educational goals. In this section, major themes were presented to illustrate how the activities changed the four interrelated dimensions of learning: who is participating, when to learn, what to learn, and how to learn.

Who is participating

Microblogging changes who is participating in learning by allowing immediate and wide participations. Studies showed that microblogging can be used to enable interactions between audience and speakers in a live event or to encourage virtual participations from people worldwide.

Enabling immediate participation. In some studies, microblogging was used as a backchannel in a live event to encourage immediate participation from the audience (Elavsky et al., 2011). It was argued that the single speaker paradigm, which was typical in traditional lectures or conference presentations, limited the presenter-audience interaction (Elavsky et al., 2011; Ross, Terras, Warwick, & Welsh, 2011). There were often problems such as lack of feedback, nervousness about asking questions and so on. Microblogging made it easy for the audience to ask questions, have discussions, share resources (Ebner, 2009b; Ross et al., 2011), and create shared comments on learning

materials (Ebner, 2009a). Such immediate participation provides a means for the audience to actively interact with the content, and also allows presenters to respond dynamically to audience's reactions.

Inviting virtual participation. Microblogging extends the participation beyond the classroom or conference room by engaging those who are not physically present. Virtual networks of learning may be formed with learners, practitioners, professionals and other interest groups in the field. In Rinaldo et al.'s (2011) study, for example, the professor's tweets in a consumer behavior course received attention from a few companies, who started to follow the professor's tweets, thus creating an expanded learning community. Such virtual participations were particularly valuable in literacy and language learning, where using the language for real communication was crucial (Antenos-Conforti, 2009). Waller (2010) used Twitter to engage a group of struggling writers in authentic literacy practices. Students who were encouraged to use Twitter to communicate their thinking with the class received replies from not only their classmates but also followers from outside of the class. Waller reported that students enjoyed writing for real audience, and were excited about publishing their thoughts for others to read. It is unknown, however, whether the activity improved the students' writing skills. In another study (Borau, Ullrich, Feng, & Shen, 2009), Twitter was used to provide opportunities for learners to practice the target language in authentic environments. In their study, nearly half of the students reported that they had communicated with native speakers on Twitter, whom they may not have access to otherwise. Borau and colleagues concluded that the activity helped learners develop communicative and cultural competences in language learning, but not strategic competence.

When to learn

Thanks to the convenience and flexibility of microblogging, learning can happen beyond pre-scheduled class times, and learners' time-on-task may be significantly expanded with opportunities of spontaneous learning and sustained learning.

Documenting ongoing processes. Wright's study (2010) illustrated the great benefits of microblogging for documenting ongoing processes and just-in-time thoughts. In his study, eight graduate students in teacher education were asked to tweet three times each workday in response to: (a) their experiences of teaching, and (b) a list of questions such as "What do my students say about their learning right now?" and "What do I need to overcome or solve?". This activity enabled students to share and reflect upon their teaching experiences. According to Wright (2010), because Twitter was accessible via mobile phones, tweets could be sent when students were "walking in corridors," "in cars at the end of the teaching day" or "during lunch breaks" (p.261) as the thoughts occurred. As a result, learning took place in dots of actions that consist of small, discrete moments rather than in a linear and sequential manner (Ihanainen, 2011).

Sustaining interaction and communication. Microblogging serves as an excellent informal route for sustained interaction and communication. A few studies examined how instructors used microblogging for extended communication beyond the classroom, such as posting learning materials (Lowe & Laffey, 2011; Rinaldo et al., 2011) or announcing events and assignments (Perifanou, 2009). In Lowe and Laffey's study (2011), for example, the instructor used Twitter in a marketing class to post updates on recent marketing events, contemporary marketing issues, and examples of key concepts. Students were able to access and exchange ideas about the updated information and

materials in a timely manner. In this way, microblogging enabled sustained engagement and maximized the opportunities for learner-content, learner-learner, learner-instructor interactions.

What to learn

When learners are connected via microblogging, the content of learning is no longer limited to the materials provided by the instructor. Everyone in the virtual learning community may serve as information provider as well as information consumer and knowledge constructor.

Expanding learning content. Lowe and Laffey (2011) believed that microblogging allowed educators to bring real-world marketing concepts to the class in a timely fashion because it provided instantaneous access to the up-to-date news stories. When microblogging was solely used for instructors to post information, however, students were not actively engaged, and did not respond often to the instructors' tweets (Lowe & Laffey, 2011). In contrast, students participated actively when they were invited to contribute and share information and resources (Dunlap & Lowenthal, 2009; Perifanou, 2009). In some cases, microblogging allowed students to get involved in a larger community and connected with the professionals in the field. Rinaldo et al.'s (2011) study provided such an example: Some students in a consumer behavior class started to follow the professionals or companies' tweets and shared relevant tweets with the entire class. Students learned from the experience how marketing professionals used social media to monitor customer reactions in real world.

How to learn

Microblogging is a hybrid platform that facilitates both online and offline communication (Antenos-Conforti, 2009). Such an environment is particularly suitable for designing social learning experience grounded in social constructivism (Vygotsky, 1978), distributed cognitions theory (Pea, 1997) and connectivism (Siemens, 2005). Many studies used microblogging to enhance social learning opportunities and reported improved interactions.

Fostering interactive activities. Microblogging was sometimes used to create synchronous class activities. In McWilliams et al.'s study (2011), Twitter was integrated in a literacy class, where students were asked to tweet as their assigned characters in a play to develop understandings of these characters. Similarly, Perifanou's study (2009) reported how a teacher in a foreign language classroom created micro-gaming language activities to enhance students motivation and collaboration. An example of such activities was digital storytelling, where students took turns to create a digital story in the class microblogging space.

Encouraging informal learning. In some other studies, microblogging was adopted to encourage asynchronous communication and informal learning beyond the formal classroom learning. Microblogging was often used in massive open online courses in combination with other social networking tools to aggregate information (de Waard et al., 2011; Kop, 2011; Kop, Fournier, & Mak, 2011). With microblogging, students had discussions on proposed themes (Holotescu & Grosseck, 2009), expressed ideas about class subjects, asked questions, shared materials or helped each other with the assignments (Dunlap & Lowenthal, 2009; Perifanou, 2009), leading to increased social interactions and collaboration. Junco and colleagues (2011) reported that students asked

more questions and engaged with faculty more when they were on Twitter than on an alternative social learning environment – Ning. In Kop and colleagues' study (2011), participants ranked Twitter as the most important tool for interaction and communication in the massive open online course.

Educational Effects

Learning community

The formation of a learning community is a dominant theme across studies. The concept of a learning community is associated with the social view of learning which values the collective and collaborative aspects of learning. Though microblogging is not specifically designed for conversations, conversations occur when people use the @ symbol to respond to each other. Such conversations are perceived as a marker of "social coherence and community forming" (Borau, Ullrich, Feng, & Shen, 2009, p.84). Ebner and colleagues (2010) argued that microblogging allowed users to be virtually present and involved in a community without time and space restrictions. Consistently, researchers found that microblogging increased student-instructor and student-student communication, enhanced social presence, built a strong learning community, and largely reduced the sense of isolation among student groups (Dunlap & Lowenthal, 2009; Ebner & Maurer, 2009; Wright, 2010).

Participation and engagement

Related to learning community, increased participation and engagement is another shared theme among the 21 studies. Researchers found that when microblogging was incorporated into learning activities, students participated at a higher level than they would normally do (Ebner, Lienhardt, Rohs, & Meyer, 2010). Student interactions via

microblogging led to "a culture of engagement" and a "deepening of their interpersonal connections" (Junco et al., 2011, p. 129). According to Kop (2011), the increased level of presence and involvement enhanced the depth of learning and subsequently the learning experience.

The increased participation and engagement may be attributed to several reasons. Firstly, microblogging offered students a convenient channel to express their ideas. According to Junco et al. (2011), the integration of Twitter as a communication tool encouraged participation from some students who otherwise may not be active participants in class. Secondly, microblogging provided students with opportunities to communicate virtually at any time. As a result, students' engagement with the course content or relevant activities was extended beyond the limited class time. For example, with the aid of microblogging, the instructor's brief digression in class could trigger an in-depth discussion lasting several weeks (Elavsky et al., 2011). Finally, once a microblogging community was formed, the social-networking factors sustained participants' willingness to stay connected (Antenos-Conforti, 2009) and to maintain the communication even after the original learning tasks had been completed. It was evidenced that learners remained active even after the course had ended, communicating and interacting with facilitators or other participants (Dunlap & Lowenthal, 2009; Holotescu & Grosseck, 2009).

Reflective thinking

A few researchers investigated different ways that microblogging was used to encourage reflective thinking, in particular, just-in-time reflections. With the help of mobile devices, users can post and share updates anywhere anytime. The exchanges are

automatically recorded online, making it easy to review them in the future. In Wright's study (2010), students used Twitter to record and share their questions, thoughts, doubts as well as exciting moments during their teaching practices anytime in a day. The ability to instantly record and share their thoughts facilitated the generation and development of ideas. In addition, with microblogging, students were able to continue writing about a topic over a longer period of time, leading to a deeper level of reflection (Ebner & Maurer, 2009). The 140 character limit is viewed as an advantage by some researchers, because it requires participants to write succinctly by focusing on the key points. In Wright's study (2010), students reported that they had to think more in-depth about the content because the 140 characters forced them to write clearly and concisely.

Collaborative learning

Microblogging was used in the classroom to support collaborative activities (McWilliams et al., 2011; Perifanou, 2009), such as having book discussions, organizing study groups and so on (Junco et al., 2011). Among all the studies, Junco et al.'s study is the only one that examined the effect of microblogging-based activities on student learning outcomes. By comparing students' grades between the experimental group, in which Twitter was incorporated, and the control group, they concluded that the grades of the experimental group were significantly higher than those of the control group. Junco et al. (2011) noted, however, the increases in grades may be explained more by the instructor's overarching attitude about teaching and learning than the microblogging technology itself. They called for future research taking into consideration of other variables that might have impacted students' grades.

Challenges of Using Microblogging

The 21 studies identified several major challenges when microblogging was integrated in educational settings. The first challenge was participants' unfamiliarity with microblogging. Though microblogging was gaining popularity, according to the Pew Internet Project surveys (Lenhart, Purcell, Smith, & Zickuhr, 2010), only 8% of 12-17 years old internet users used Twitter and only 19% of adult Internet users used Twitter or similar services to post updates or view others' updates. Studies suggested that many learners were not familiar with Twitter and found it difficult or even intimidating to use (Agherdien, 2011; Costa, Beham, Reinhardt, & Sillaots, 2008; Rinaldo et al., 2011). The reluctance to learn or use the technology limited the scope of interactivity that is afforded by microblogging (Lowe & Laffey, 2011). As a result, some researchers suggested finding out creative ways to convince students of Twitter's benefits or establishing rewards to encourage its use (Rinaldo et al., 2011). Furthermore, despite of its affordance in facilitating communication, microblogging can sometimes lead to "an unwieldy information flow, known as information overload" (Ebner et al., 2010, p. 98). The noise information posted online can be distractive (Holotescu & Grosseck, 2009), and some students may feel it a waste of time reading posts containing less useful information (Rinaldo et al., 2011). Additionally, research consistently showed that only a small percent of participants actively contributed to the microblogs (Ten out of 150 attendees in Ebner's (2009b) study; 23% of the registered members in the DRHA conference in Ross et al.'s (2011) study, 40-60 individuals out of 1616 in Kop's (2011) study), while the majority were lurkers. Antenos-Conforti's (2009) study had similar findings. In her study, though some students tweeted actively, 12 out of 22 students did not reach the minimum number of tweets required by the instructor. It is unclear why this happened and how to

encourage participation from this group of learners. Finally, though the 140 character limit was viewed as a valuable feature by some researchers, others believed that it posed challenges to learners, because it required the ability to focus and express oneself explicitly (Ebner et al., 2010). The length limit may also have made microblogging inappropriate for certain activities, especially those requiring elaborated reflection on complex ideas (Rankin, 2009). Clearly, future research is needed to address these challenges.

Suggestions on Educational Use of Microblogging

Researchers provided a few suggestions for educators who are interested in incorporating microblogging into teaching. Though these suggestions are yet to be proven as effective, they serve as useful guidelines for designing microblogging-based learning activities. Dunlap and Lowenthal (2009) offered the following five guidelines based on their experience: (a) establishing relevance for students, (b) defining clear expectations for participation, (c) modeling effective Twitter use, (d) building Twitter-derived results into assessment, and (e) continuing to actively participate in the Twitter community. Lowe and Laffey (2011) suggested using hashtags and shortened URLs in tweets, and made several pedagogical recommendations for Twitter integration, including: a) communicating with students the rationale of using Twitter, b) avoiding over tweeting and information overload, c) weaving important tweets into lecture and class discussion, and d) using tweets to supplement and back up course material. Finally, Holotescu and Grosseck (2009) suggested developing a specification for evaluating students' participation in microblogging-based courses and using microblogs in combination with other collaborative technologies.

Suggestions for Future Research

This section discusses the limitations of the current research in MIE and suggest possible directions for future research. First, the majority of the studies were conducted in formal higher education settings, and few examined the educational use of microblogging in other settings (e.g. K-12 or corporations). Additionally, the microblogging activities were very often incorporated as an extension or supplement of formal classroom learning. How learning takes place in naturally formed mircoblogging communities is largely unknown. More research is needed to investigate microblogging in various educational settings, including formal, informal, higher education, k-12, corporate, community of practitioners, emerging online learning communities, just-in-time training, and so on. Such efforts will deepen our understanding of how learning occurs in microblogging-based environments and what types of learning microblogging promote.

Second, most of the current studies were conducted over a limited period of time, usually several weeks. Compared to face-to-face communication, meaningful interactions in CMC requires extra time to occur because the text-based asynchronous environments may negatively influence the creation of a productive social space (Kreijns, Kirschner, & Jochems, 2003). The integration of microblogging may not lead to any noticeable benefits in a short term because it takes time for community to form and for knowledge to accumulate. Other factors such as learners' unfamiliarity with the technology may also prevent learners from getting immediately engaged. Additionally, research conducted in a short period of time fails to capture any lasting impact of such interventions. To better understand MIE, future studies need to observe how learners participate and learn for a relatively long time.

Third, more MIE research with methodological and scientific robustness is highly

needed. According to Furlong and Oancea (2005), explicitness in designing and reporting

is essential to make the research peer-reviewable, so it is important to pay systematic

attention to details in the design and the reporting of research. The analysis revealed,

however, a number of MIE studies provided limited information on participants and

settings, implementation procedures, or types of data collected and analyzed. Establishing

trustworthiness is also fundamental in judging research quality, and it concerns about

reliability, groundedness, plausibility and so on (Furlong & Oancea, 2005).

Unfortunately, few reviewed studies checked inter-rater reliability for content analysis or

survey reliability when survey instruments were used. These problems undermine the

quality of the research, making the findings less persuasive or generalizable to other

circumstances. Finally, the methods adopted for data analysis have been limited.

Innovative research methods are needed to understand such issues as how the

conversation evolves and how participants learn over time. Many studies relied on

participants' self-report by conducting one-time interviews or surveys at the end of the

intervention. We believe, however, that methods providing ongoing evaluation of

learners' experience are needed to capture the change in the directions and levels of

engagement over time. Similarly, coding posts into themes or categories are necessary to

understand the tweets. But such analyses only informed us "what was talked about and

how often, but did not illuminate how the subject was engaged *nor to what end*" (Elavsky

et al., 2011, p. 228). In addition, they did not tell us how the discourse evolved. Powerful

data analysis methods, such as educational data mining (e.g., Hung & Zhang, 2008; Hung

& Zhang, 2011) and social network analysis (Hansen, Shneiderman, & Smith, 2010),

may help reveal how communication and learning occur via microblogging and build predictive models based on learners' ubiquitous learning behaviors. Fourth, only one of the studies was experimental in nature, and all the rest were descriptive. This is consistent with Shih, Feng and Tsai's (2008) finding that descriptive research was a common trend in the field of e-learning. Admittedly, descriptive research plays an important role in educational research, and often illuminates knowledge that we might not otherwise be aware of. The data collected from descriptive research could be used to recommend new approaches of technology integration (Knupfer & McLellan, 1996). To develop effective practices that improve learning, however, experimental and developmental research is also needed to test the effectiveness of the recommended educational approaches.

Finally, most studies described what happened when microblogging was incorporated into the classrooms. But how to improve the effectiveness of microblogging integration was not thoroughly studied. Many factors may contribute to the learning experience. The types of instructor's tweets, for example, can influence students' perception of instructor credibility (Johnson, 2011). How instructors provide guidance and how learners post may also impact the learning processes. Therefore, future research needs to explore factors that inhibit or enhance the effectiveness of microblogging-based activities and investigate how to provide appropriate instruction, facilitation and evaluation throughout the activities. Possible questions for future research are: "What factors affect learners' engagement/learning in a microblogging-based activity?" "How to design activities that weave microblogging conversation into classroom learning without causing information overload?" "How to structure the activity to prompt active reflection and collaboration?" "How should the instructor guide and support the learning

processes?" and "How to evaluate the social, collaborative and process-based learning that occurs in such activities?"

Conclusion

With microblogging, users can share an idea instantly, exchange information in real time, and get connected with virtual communities worldwide. This has made it ideal for spontaneous, immediate and sustained communication. This study was conducted five years after Twitter was first launched. Given the rapid growth of learning technologies, reviewing and critiquing the research over the past five years is critical to build a foundation for our knowledge base and to guide future research and practices of MIE. The analysis of the MIE research illustrates that microblogging provides immense opportunities to extend learning beyond the classrooms and blur the line between formal and informal learning. However, the differences among the identified studies in terms of settings, sample size, duration and quality have made it challenging to compare and synthesize the findings across the studies. The analysis, therefore, has led to limited conclusive results. Future research is needed to confirm the existing findings and address the fundamental questions of how learning occurs in microblogging-enhanced environments, what factors affect the learning processes, what has been learned, and how to support effective learning in such environments.

Reference

Agherdien, N. (2011). Twitter and Edulink: Balancing Passive Consumption With
Knowledge Creation. In P. Balcaen (Ed.), *Proceedings of the 6th International
Conference on e-Learning* (pp. 489-492). Reading, UK: Academic Conferences,
Ltd.

Antenos-Conforti, E. (2009). Microblogging on Twitter: Social networking in
intermediate Italian classes. In L. Lomicka & G. Lord (Eds.), *The Next
Generation: Social Networking and Online Collaboration in Foreign Language
Learning* (pp. 59-90). San Marcos, TX: CALICO Publications.

Borau, K., Ullrich, C., Feng, J., & Shen, R. (2009). Microblogging for language learning:
Using twitter to train communicative and cultural competence *Proceedings of
International Conference on Web Based Learning–ICWL 2009* (pp. 78-87). Berlin:
Springer-Verlag.

Click, A., & Petit, J. (2010). Social networking and Web 2.0 in information literacy. *The
International Information & Library Review, 42*(2), 137-142. doi:
10.1016/j.iilr.2010.04.007

Costa, C., Beham, G., Reinhardt, W., & Sillaots, M. (2008). *Microblogging In technology
enhanced learning: A use-case inspection of PPE summer school 2008*. Paper
presented at the Workshop at the European Conference on Technology Enhanced
Learning (ECTEL), Maastricht, The Netherlands.

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

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.

Ebner, M. (2009a). Interactive lecturing by integrating mobile devices and micro-

blogging in higher education. *Journal of Computing & Information Technology,

17*(4), 371-381. doi: 10.2498/cit.1001382

Ebner, M. (2009b). Introducing live microblogging: How single presentations can be

enhanced by the mass. *Journal of Research in Innovative Teaching, 2*(1), 91-100.

Ebner, M., Lienhardt, C., Rohs, M., & Meyer, I. (2010). Microblogs in Higher Education

– A chance to facilitate informal and process-oriented learning? *Computers &

Education, 55*(1), 92-100. doi: 10.1016/j.compedu.2009.12.006

Ebner, M., & Maurer, H. (2009). Can weblogs and microblogs change traditional

scientific writing? *Future Internet, 1*(1), 47-58. doi: 10.3390/fi1010047

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. doi: 10.1080/17439884.2010.549828

Furlong, J., & Oancea, A. (2005). Assessing quality in applied and practice-based

educational research: A framework for discussion. In J. Blackmore, J. Wright & V.

Harwood (Eds.), *Review of Australian Research in Education: Counterpoints on

the Quality and Impact of Educational Research - A Special Issue of The*

Australian Educational Researcher (Vol. 6, pp. 89-104). Gruyere, Australia: AARE.

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. doi: 10.3102/0013189x09336671

Hansen, D. L. (2011). Exploring social media relationships. *On the Horizon, 19*(1), 43-51. doi: 10.1108/10748121111107726

Hansen, D. L., Shneiderman, B., & Smith, M. A. (2010). *Analyzing social media networks with NodeXL: Insights from a connected world*. Burlington, MA: Elsevier Inc.

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.

Hung, J., & Zhang, K. (2008). Analyzing online learning behaviors and activity patterns and making predictions with data mining techniques in online teaching. *Journal of Online Learning and Teaching, 4*(4), 426-437.

Hung, J., & Zhang, K. (2011). Examining mobile learning trends 2003-2008: A categorical meta-trend analysis using text mining techniques. *Journal of Computing in Higher Education, 24*(1), 1-17. doi: 10.1007/s12528-011-9044-9

Ihanainen, P., & Moravec, J. (2011). Pointillist, cyclical, and overlapping: Multidimensional facets of time in online education. . *The International Review Of Research In Open And Distance Learning, 12*(7), 27-39. Retrieved from http://www.irrodl.org/index.php/irrodl/article/view/1023/2022
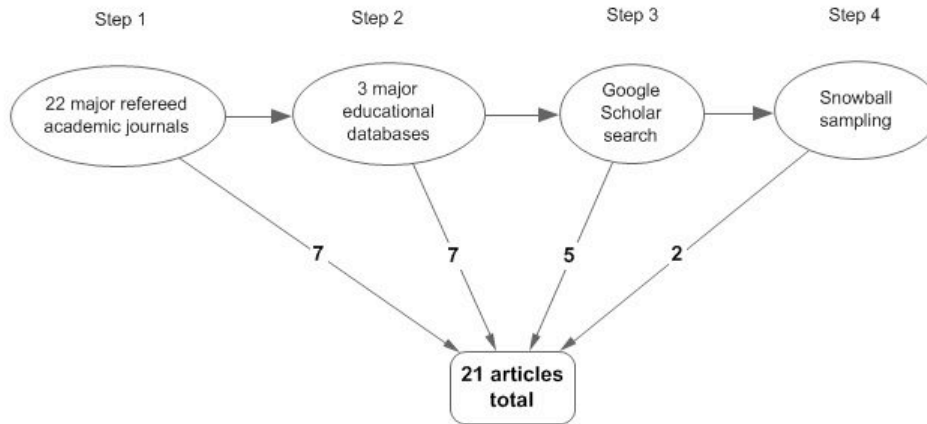
Java, A., Song, X., Finin, T., & Tseng, B. (2007). Why we Twitter: Understanding microblogging usage and communities *Proceedings of the 9th WebKDD and 1st SNA-KDD 2007 workshop on Web mining and social network analysis, WebKDD/SNA-KDD'07* (pp. 56-65). New York, NY: ACM.

Johnson, K. A. (2011). The effect of Twitter posts on students' perceptions of instructor credibility. *Learning Media and Technology, 36*(1), 21-38. doi: 10.1080/17439884.2010.534798

Junco, R., Heiberger, G., & Loken, E. (2011). The effect of Twitter on college student engagement and grades. *Journal of Computer Assisted Learning, 27*(2), 119-132. doi: 10.1111/j.1365-2729.2010.00387.x

Knupfer, N. N., & McLellan, H. (1996). Descriptive research methodologies. In D. Johnassen (Ed.), *Handbook of research for educational communications and technology* (1st ed., pp. 1196-1212). New York: Macmillan.

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

Kreijns, K., Kirschner, P. A., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review

of the research. *Computers in Human Behavior, 19*(3), 335-353. doi: 10.1016/s0747-5632(02)00057-2

Lenhart, A., Purcell, K., Smith, A., & Zickuhr, K. (2010). Social media & mobile Internet use among teens and young adults. Retrieved February 3, 2011, from the Pew Research Center http://www.pewinternet.org/~/media//Files/Reports/2010/PIP_Social_Media_and _Young_Adults_Report_Final_with_toplines.pdf

Lowe, B., & Laffey, D. (2011). Is Twitter for the birds?: Using Twitter to enhance student learning in a marketing course. *Journal of Marketing Education, 33*(2), 183-192. doi: 10.1177/0273475311410851

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, 2*(3).

Paz, K. d. l. (2009). The year of social networking. *The Technology Teacher, 69*(1), 6.

Pea, R. D. (1997). Distributed intelligence and designs for education. In G. Salomon (Ed.), *Distributed cognitions: Pyschological and educational considerations* (pp. 47-87). Cambridge, UK: Cambridge University Press.

Perifanou, M., A. . (2009). Language micro-gaming: fun and informal microbloggin activities for language learning. *Communications in Computer and Information Science, 49*, 1-14. doi: 10.1007/978-3-642-04757-2_1

Rankin, M. (2009). Some general comments on the "Twitter Experiment", from http://www.utdallas.edu/~mar046000/usweb/twitterconclusions.htm

Rinaldo, S. B., Tapp, S., & Laverie, D. A. (2011). Learning by Tweeting: Using Twitter

as a Pedagogical Tool. *Journal of Marketing Education, 33*(2), 193-203. doi:

10.1177/0273475311410852

Ross, C., Terras, M., Warwick, C., & Welsh, A. (2011). Enabled backchannel:

conference Twitter use by digital humanists. *Journal of Documentation, 67*(2),

214-237. doi: 10.1108/00220411111109449

Shih, M., Feng, J., & Tsai, C. (2008). Research and trends in the field of e-learning from

2001 to 2005: A content analysis of cognitive studies in selected journals.

Computers and Education, 51(2), 955-967. doi: 10.1016/j.compedu.2007.10.004

Siemens, G. (2005). Connectivism: A learning theory for the digital age. *International*

Journal of Instructional Technology & Distance Learning, 2(1). Retrieved from

http://itdl.org/Journal/Jan_05/article01.htm

Thames, G. (2009). Twitter as an educational tool. *Journal of Child and Adolescent*

Psychiatric Nursing, 22(4), 235-235. doi: 10.1111/j.1744-6171.2009.00208.x

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological*

processes. Cambridge, MA: Harvard University Press.

Waller, M. (2010). Using Twitter in the Primary classroom. *English-Four to Eleven, 39*,

14-16.

Wright, N. (2010). Twittering in teacher education: reflecting on practicum experiences.

Open Learning: The Journal of Open, Distance and e-Learning, 25(3), 259-265.

doi: 10.1080/02680513.2010.512102

Figures

Figure 1: The process of identifying eligible MIE research publications

Tables

Table 1: Settings in the reviewed studies (n=21)

Settings	N	Studies
Conference	2	Ebner (2009b); Ross, et al. (2011)
K-12	1	Waller (2010)
Higher Education	18	Ebner & Schiefner (2008); Antenos-Conforti (2009); Borau, et al. (2009); Dunlap & Lowenthal (2009); Ebner (2009a); Holotescu & Grosseck (2009); Perifanou (2009); Costa, et al. (2010); Ebner, et al. (2010); Wright (2010); Agherdien (2011); de Waard, et al. (2011); Elavsky, et al. (2011); Junco, et al. (2011); Kop (2011); Kop, et al. (2011); Lowe & Laffey (2011); Rinaldo, et al. (2011)

Table 2: Learning topics in the studies of microblogging in higher education (n=21)

Learning Topics	N	Studies
Language	4	Antenos-Conforti (2009); Borau, et al. (2009); Perifanou (2009); Agherdien (2011)
Instructional Tech/Design	6	Ebner & Schiefner (2008); Dunlap & Lowenthal (2009); Costa, et al. (2010); de Waard, et al. (2011); Kop (2011); Kop, et al. (2011)
New Media	3	Holotescu & Grosseck (2009); Ebner, et al. (2010); Elavsky, et al. (2011)
Business	2	Lowe & Laffey (2011); Rinaldo, et al. (2011)
Others	3	Ebner (2009a); Wright (2010); Junco, et al. (2011)
Not Available	3	Ebner (2009b); Ross, et al. (2011); Waller (2010)

Table 3: Sample sizes in the reviewed studies (n=21)

Sample Sizes	N	Studies
<10	1	Wright (2010)
10-50	6	Ebner & Schiefner (2008); Antenos-Conforti (2009); Ebner (2009a); Holotescu & Grosseck (2009); Perifanou (2009); Ebner, et al. (2010)
51-100	2	Borau, et al. (2009); Costa, et al. (2010)
101-150	4	Ebner (2009b); Junco, et al. (2011); Lowe & Laffey (2011); Rinaldo, et al. (2011)
>150	6	Agherdien (2011); de Waard, et al. (2011); Elavsky, et al. (2011); Kop (2011); Kop, et al. (2011); Ross, et al. (2011)
Not Available	2	Dunlap & Lowenthal (2009); Waller (2010)

Table 4: Duration of intervention in the reviewed studies (n=21)

Duration	N	Studies
<1day	2	Ebner (2009a); Ebner, M. (2009b)
1-8 weeks	8	Ebner & Schiefner (2008); Borau, et al. (2009); Holotescu & Grosseck (2009); Costa, et al. (2010); Ebner, et al. (2010); Wright (2010); Lowe & Laffey (2011); Ross, et al. (2011)
9-15 weeks	7	Antenos-Conforti (2009); Dunlap & Lowenthal (2009); de Waard, et al. (2011); Elavsky, et al. (2011); Junco, et al. (2011); Kop (2011); Kop, et al. (2011)
>15 weeks	2	Agherdien (2011); Rinaldo, et al. (2011)
Not Available	2	Perifanou, M. (2009); Waller, M. (2010)

Table 5: Data types in the reviewed studies (n=21)

Data Types	N	Studies
Number of Posts	14	Ebner & Schiefner (2008); Antenos-Conforti (2009); Ebner (2009a); Ebner (2009b); Holotescu & Grosseck (2009); Ebner, et al. (2010); Wright (2010); de Waard, et al. (2011); Elavsky, et al. (2011); Kop (2011); Kop, et al. (2011); Junco, R., et al. (2011); Rinaldo, et al. (2011); Ross, C., et al. (2011)
Examples of Posts	5	Antenos-Conforti (2009); Borau, et al. (2009); Dunlap & Lowenthal (2009); Waller (2010); Junco, R., et al. (2011);
Categories of Posts	6	Antenos-Conforti (2009); Ebner (2009b); Ebner, et al. (2010); Wright (2010); Elavsky, et al. (2011); Ross, et al. (2011)
Survey /Interview	15	Ebner & Schiefner (2008); Antenos-Conforti (2009); Borau, et al. (2009); Ebner (2009a); Perifanou (2009); Costa, et al. (2010); Ebner, et al. (2010); Wright (2010); Agherdien (2011); Elavsky, et al. (2011); Kop, et al. (2011); Junco, R., et al. (2011); Lowe & Laffey (2011);

		Rinaldo, et al. (2011); Ross, et al. (2011)
Academic Grades	1	Junco, et al. (2011)
Others	3	Dunlap & Lowenthal (2009); Costa, et al. (2010); Waller (2010)

Appendix 1. An Analysis of the Studies on Microblogging in Education

Author	Settings	Participants	Size	Duration	Educational Goals	Educational Activities
Ebner, M. & Schiefner, M. (2008)	higher education	people who join an eLearn community	23	8 weeks	sharing information and building community	having discussions and sharing information on teaching and learning with digital technologies
Antenos-Conforti, E. (2009)	higher education	students enrolled in an Italian language class	22	14 weeks	having learners use the language for authentic purposes	posting at least two tweets of a personal nature and reply to a follower's tweet every week.
Borau, K., et al. (2009)	higher education	adult foreign language learners	98	7 weeks and 2 days	providing opportunities for learners to practice the target language in authentic environment	posting at least seven tweets a week and reading their fellow students' tweets
Dunlap, J. C., & Lowenthal, P. R. (2009)	higher education	students enrolled in an online instructional design course	n/a	1 semester	enhancing social presence and student engagement	information sharing, collaboration, brainstorming, problem-solving, and context-based content creation
Ebner, M. (2009a)	higher education	college students in a course on informatics and society	23	n/a	enhancing interaction in a large lecture room	annotating learning materials and interacting with the class during the lectures
Ebner, M. (2009b)	conference	participants of an e-learning conference	150	74 minutes	encouraging audience feedback and interaction	conference backchannel
*Holotescu, C. & Grosseck, G. (2009)	higher education	educational actors enrolled in an online class (students, teachers, developers, librarians etc.) on microblogging	40	2 weeks	collaborative learning	holding discussions on proposed themes
Perifanou, M. (2009)	higher education	students enrolled in an Italian language class	10	n/a	enhancing motivation, participation and collaboration in language learning	having micro-gaming language activities; backchannel for communication
Costa, C., Beham, G., et al. (2010)	higher education	doctoral students and researchers in the field of technology enhanced learning	68	1 week	participating and inputting their ideas about summer school experience	backchannel for communication on summer school activities
Ebner, M., et al. (2010)	higher education	students enrolled in a new media and multi-channel management course	34	6 weeks	fostering informal and process-oriented learning	documenting and sharing learning processes during 6 weeks' learning
Waller, M. (2010)	K-12	students learning literacy in a primary classroom	n/a	n/a	extending the classroom learning, increasing engagement, engaging students in authentic writing	having writing activities
Wright, N. (2010)	higher education	graduate students in teacher education	8	7 weeks	generating and developing self-reflection	reflecting on practicum experiences
Agherdien, N. (2011)	higher education	students enrolled in an online anthropology & development course	443	2 semesters	encouraging social interaction and engagement	posting weekly summarization of selected readings
Elavsky, C. M., et al. (2011)	higher education	students enrolled in the media & democracy course	240	1 semester	enhancing the learning process in a large-lecture classroom	tweeting freely in relation to the class when attending the lectures
Junco, R., et al. (2011)	higher education	students enrolled in a seminar course for pre-health professional majors	125	14 weeks	maximizing active learning	multiple activities: having discussion, asking questions, posting course arrangement/announcement, organizing study groups and so on
*Lowe, B. & Laffey, D. (2011)	higher education	students enrolled in a postgraduate marketing course	123	8 weeks	bringing real-world examples into the classroom in a timely manner	instructors posting marketing events, information on contemporary marketing issues and examples of key concepts and raised issues for retrospection
*Rinaldo, S. B., et al. (2011)	higher education	students enrolled in a consumer behavior course	146	2 semesters	promoting social interactions, discussion, and reflection	instructor using Twitter to send class announcements and social media related content; student activities were not detailed.
*Ross, C., et al. (2011)	conference	participants of professional conferences on digital humanities	n/a	3 conferences 9 days total	facilitating discussion and reflection	conference backchannel

Author	Research Type	Data Types	Educational Effects
Ebner, M. & Schiefner, M. (2008)	descriptive	number of posts, survey results	People used Twitter to stay connected and share information in the eLearn community
Antenos-Conforti, E. (2009)	descriptive	number of tweets, selected examples of tweets, content of tweets (Tweets were categorized based on topic; no inter-rater reliability check), questionnaire results	Students engaged in Twitter for many reasons (e.g., community of followers, both classmates and native speakers) and that they perceived the experience as positively affecting their learning of the Italian language and of Italian culture
Borau, K., et al. (2009)	descriptive	selected examples of tweets; survey results	students perceived an increase in the sense of community. Analysis of tweets suggests the activity is helpful in developing communicative and cultural competence in language learning, but not strategic competence.
Dunlap, J. C., & Lowenthal, P. R. (2009)	descriptive	examples of how students used Twitter; students' feedback on their experience	Students were found to engage in such social interactions ask questions, seek for help, share resources, and interact with professional practitioners outside the classroom.
Ebner, M. (2009a)	descriptive	number of tweets, data from the brief oral interviews	There is a high level of participation and learners reported positive experience.
Ebner, M. (2009b)	descriptive	number of tweets, content of tweets (Tweets were coded into categories; no inter-rater reliability check)	The use of Twitter improved audience feedback and led to greater interactivity.
* Holotescu, C. & Grosseck, G. (2009)	descriptive	number of posts	Students participated in the online discussion and continued using the tool after the course ended.
Perifanou, M. (2009)	descriptive	data from questionnaires and informal group interviews	Students reported themselves as highly motivated and perceived a high level of learning.
Costa, C., Beham, G., et al. (2010)	descriptive	visualizations of tweets with Wordle; survey results	The majority of participants (70%) believed that the use of Twitter encouraged them to join discussion about topics presented during the summer school. Some felt it was distractive and the 140 character length was limitative.
Ebner, M., et al. (2010)	descriptive	number of posts, content of posts (Posts were coded into categories; no inter-rater reliability check); survey results	There was a high volume of communication between students and students reported positive experience.
Waller, M. (2010)	descriptive	observation, selected examples of tweets	Students were excited, enjoyed the activities and felt a great sense of achievement.
Wright, N. (2010)	descriptive	number of tweets; content of tweets (Tweets were categorized based on topic; no inter-rater reliability check); data from focus group interview	The activity forced student deliberate reflection on their teaching, and reduced the feeling of isolation
Agherdien, N. (2011)	descriptive	survey results	Most students found the use of Twitter fun and educationally rewarding, but some found it difficult and unnecessary.
Elavsky, C. M., et al. (2011)	descriptive	number of tweets, content of tweets (Tweets were coded for themes, inter-rater reliability checked), survey results	Student participation and enthusiasm in relation to the course improved, but only a small amount of students used Twitter actively.
Junco, R., et al. (2011)	experimental	number of tweets, selected examples of tweets, engagement survey results, student grades	Student engagement and grades improved.
* Lowe, B. & Laffey, D. (2011)	descriptive	data from interview and survey (survey reliability checked)	Students found Twitter useful to relate classroom material to real-world examples. But the interactivity among students was limited and few students tweeted back.
* Rinaldo, S. B., et al. (2011)	descriptive	number of instructor's tweets, survey results, themes identified from focus group interview (interrater reliability checked)	Students felt using Twitter increased their sense of involvement and overall satisfaction with the course. But the resistance to use Twitter also existed.
* Ross, C., et al. (2011)	descriptive	data from survey on the most active participants, number of tweets, content of tweets (Tweets were coded for frequently used words and categories; no reliability check)	Using Twitter as conference backchannel increased interaction between speaker and audience as well as between local and remote participants.

Erratum

There is an error on page 799 of Fei Gao, Tian Luo and Ke Zhang (2012) Tweeting for learning: A critical analysis of research on microblogging in education published in 2008–2011, *British Journal of Educational Technology* Volume 43, Issue 5.

The following three articles are incorrectly marked with an asterisk indicating that they have not been peer reviewed. We found that this is **not** the case and that their papers **were** peer reviewed before publication in JoD.

Lowe, B., & Laffey, D. (2011). Is Twitter for the birds?: *Using Twitter to enhance student learning in a marketing course. Journal of Marketing Education, 33*(2), 183-192. doi: 10.1177/0273475311410851

Rinaldo, S. B., Tapp, S., & Laverie, D. A. (2011). Learning by Tweeting: Using Twitter as a Pedagogical Tool. *Journal of Marketing Education, 33*(2), 193-203. doi: 10.1177/0273475311410852

We apologise for the error.