

The Utilization of Twitter in Lectures

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Abstract: Replying to recently formulated IS-research calls (e.g. [CBSJ12, KN12, Tie13, OMOR13, Tes13, HC13]) in this article I reviewed in this article all existing 'substantial' scientific Twitter-related work containing evidence-based empirical learning and education material. After reviewing 182 Twitter-related articles, 17 articles were identified to be relevant as they contained substantial material. Based on the results of the corresponding identified studies I built up a comprehensive literature review. Analyzing this literature review I extract coherent findings such as a stable positive Twitter usage – learning outcome relationship. Finally I conclude with the suggestion of areas for future research.

1 Introduction

Twitter¹ is the world's second most established social media platform after Facebook^{2,3}. Compared to other social media platforms such as Facebook, Twitter offers a rich spectrum of publicly available data containing profiles, up to 140 character messages (tweets), and following-follower network information. Besides the very popular private- and business-oriented use, Twitter was successfully utilized in lecture experiments and seems to have become a serious tool supporting learning, e.g. [BUFS09, HF11, Par13]. In addition, most of the scholars assume that Twitter will play a significant role within lectures and classrooms in the future. For example, Hannay & Fretwell [HF11] predict that students will increasingly demand more digital communication from faculty members via Twitter. Orduña-Malea & Ontalba-Ruipérez [OMOR13] analyzed the influence of Twitter via a webometric method the influence of Twitter on Spanish educational websites belonging to universities and showed an ongoing substantial increase from the last time.

However, a comprehensive review concerning the utilization of Twitter within lectures and the resulting empirical findings is lacking, e.g. [EME11]. Consequently, corresponding IS-

¹<http://twitter.com>.

²<http://facebook.com>.

³It is reported that Twitter had 500.000.000 members in March 2013. LinkedIn reports having more than 200.000.000 users in April 2013, Xing reports 13.000.000 users in December 2012 and Facebook round about 1.000.000.000 in April 2013. In addition, Twitter runs an interesting business model [FBS+12].

research calls were recently formulated, e.g. [CBSJ12, KN12, Tie13, OMOR13, Tes13, HC13]. In particular, the very recent literature reviews on the role of social media in higher education classes by both Tess [Tes13] and Hew & Cheung [HC13] emphasized that 'substantial' studies containing empirical evidence are rare. In order to be able to evaluate the usefulness of Twitter applications within lectures, an integrative literature review of these specific utilization experiences and conceptual work from a research point of view is still needed.

Replying to these recent research calls and to speed up the theoretical progress on Twitter usage in educational environments in this article I reviewed in this article all existing 'substantial' scientific Twitter-related work containing learning and education material and built up a comprehensive literature review.

The paper is organized as follows: In section 2 I present related work. Next, in section 3 comes the research methodology concerning literature search strategy and the identification of relevant work. Section 4 contains the comprehensive review covering the particular empirical studies on Twitter usage for education and learning purposes. Next, I discuss the results in section 5. Finally, I discuss the contributions and limitations of my results and indicate future research needs in section 6.

2 Related work

Seven years after the launching of Twitter, scholars have contributed from different disciplines⁴ with empirical, technical/design-oriented, and theoretical work. However, general Twitter-specific reviews are still very rare with the following exceptions: Bruns & Burgess [BB12] contained a small review on behavioral research methods for Twitter. Efron [Efr11] shows a literature survey of Twitter retrieval methods, e. g., for sentiment analysis and opinion mining. Tiernan [Tie13] reviewed and discussed methodological points when designing lectures incorporating Twitter. Wankel [Wan09] gives an overview of the use of the main social media platforms (Facebook, blogs, YouTube, Twitter, MySpace, and Second Life) in teaching. Ebner et al. [ELRM10] experimentally investigated the use of the microblogging platforms MBlog and MediaWiki within classrooms. Arce-neaux & Weiss [AW10] analyzed the press coverage and public responses to Twitter technology from 2006 through the first months of 2009. Richter & Schäfermeyer [RS11] presented a very small overview of case studies on social media marketing (four were related to Twitter). A current state-of-the-art review of overlapping domains of geographic-related sensor techniques (Sensor Web, citizen sensing and 'human-in-the-loop sensing', etc.), and the roles these domains in environmental and public health surveillance and crisis/disaster informatics can be found in [KBRC⁺11]. Dredze [Dre12] offered a very short overview of several studies concerning health-related tweet-content including his own recent work. Micieli & Micieli [MM12] reviewed ophthalmology related peer-reviewed literature for Twitter content. Last but not least, danah m. boyd published a bibliography⁵

⁴Such as Information Technology, Information Systems, Sociology, Psychology, Philosophy, Politics, Communication Studies, Business Studies, Law, Medicine, Geography, Education Sciences, Administration Sciences, Journalism, and Linguistics.

⁵<http://www.danah.org/researchBibs/twitter.php>.

of research on Twitter and microblogging. However, a comprehensive review concerning the utilization of Twitter within lectures and the resulting empiric findings is still needed, e.g. [EME11, CBSJ12, KN12, Tie13, OMOR13, Tes13, HC13].

3 Literature search strategy

In order to extract relevant research from the published literature, a systematic literature search capturing Twitter-related work from the beginning of 2006 until 03/02/2013 was undertaken. 16 meta-databases (i.e. [SpringerLink](#), [ScienceDirect](#), [JSTOR](#), [INFORMS Pub](#), [WileyOnline](#), [IEEEExplore DL](#), [ACM DL](#), [Swets Inf. Serv.](#), [Palgrave Macmillan Pub](#), [Taylor & Francis Online](#), [Emerald Online](#), [Cambridge Journals](#), [MIT Press Journals](#), [AIS Electronic Library](#), [ACS Digital Library](#), and [PsycINFO](#)) as well as the [Journal of MIS \(JMIS\)](#)⁶ were searched, resulting in 921 articles that met the inclusion criteria (abstract or title or keywords containing 'Twitter').

To ensure including only 'substantial' scientific work, in this review I solely considered international peer-reviewed publications (journal articles and transactions) with completed research work. For qualitative reasons, poster sessions, editorials, interviews, commentaries, conference proceedings (with the exception of ICIS, ECIS, and AMCIS), and research-in-progress papers were not included.

After removing both 'unsubstantial' work and publications related to birds/zoology etc. which regularly also include 'Twitter', 182 articles were identified as 'substantial' and related to the social network Twitter.

In a next step, these 182 articles were manually evaluated in terms of their containing learning and education material. As a result, 16 articles were identified to be relevant within the learning/education domain (table 1). In addition, following [WW02] a forward and backward search was performed, resulting in one additional relevant publication ([DL09]).

Table 1: Journal list of the identified evidence-based studies within the Twitter-usage learning/education domain

Journal name	No. of articles	References
Active Learning in Higher Education	1	[KN12]
British Journal of Educational Technology	2	[JEH13, CBSJ12]
Cyberpsychology, Behavior, and Social Networking	1	[SB10]
Computers in Human Behavior	1	[JTL ⁺ 13]
Internet and Higher Education	1	[FBH12]
Journal of Chinese Political Science	1	[Sul12]
Journal of Computer Assisted Learning	2	[JHL11, Vel12]

⁶Additionally I extended the literature research by the [AIS Senior Scholars' Basket of Journals](#) who are not covered by the above meta-search databases: [Journal of MIS \(JMIS\)](#).

Table 1: Journal list of the identified evidence-based studies within the Twitter-usage learning/education domain

Journal name	No. of articles	References
Journal of Information Systems Education	1	[DL09]
Journal of Marketing Education	2	[LL11, RTL11]
Learning, Media and Technology	2	[Joh11, EME11]
Open Learning	1	[Wri10]
System	1	[LL12]
TechTrends	1	[LHB13]

4 Twitter usage for education and learning purposes

Forkosh-Baruch & Hershkovitz [FBH12] empirically examine cases in which Twitter (n=26) and Facebook (n=47) accounts were being utilized for scholarly purposes by higher-education institutes in Israel. Results from content-analysis suggest that Twitter and Facebook promotes knowledge sharing and facilitates informal learning within the communities. Still, Twitter was utilized in an "assimilation mode". In addition, relatively high dropout rates of personal Twitter accounts were found.

Kassens-Noor [KN12] analyzed in which learning contexts Twitter offers advantages over more traditional teaching methods. Conducting a comparative experiment in a small classroom setting (n=15) the results indicated advantages of Twitter use concerning the possibility of combined knowledge creation and discussion. But, due to group thinking, critical thinking and self-reflection problems may have constrained the meaningfulness of Twitter utilization within classrooms. In addition, the study of Kassens-Noor [KN12] contradicts the finding of Junco, Heiberger & Loken [JHL11] that students using Twitter are easier and more open about their own feelings and shortcomings.

Dunlap & Lowenthal [DL09] described their own experiences concerning their use of Twitter to enhance the social presence in online courses. In addition, they normatively developed guidelines for using Twitter with students.

Lomicka & Lord [LL12] investigated by discourse analysis the role of Twitter in an intermediate French class (4th or 5th semester of French at the University level) concerning community building among learners. Results suggest that participants are able to form collaborative communities quickly for learning, sharing and reflecting content by using Twitter.

Junco, Heiberger & Loken [JHL11] studied the impact of Twitter use on student learning and engagement by a semester-long experiment (experimental group: n=70; control group: n=50). As a result the experimental group showed a significantly greater increase in engagement and grade point averages than the control group.

Veletsianos [Vel12] qualitatively analyzed the latest 100 tweets from each of 45 scholars to understand scholars' naturalistic practices on Twitter. Findings indicated that scholars participating on Twitter reasoned by sharing information (resources, media, links), requesting assistance/offering suggestions, and engaging in digital identity and impression management.

Junco, Elavsky & Heiberger [JEH13] investigated the influence of Twitter usage on learning outcomes by two classroom studies (student engagement and grades). Student engagement was measured by a pre- and post-tests. In study 1, half of the class (n=65) had to use Twitter, the other half (n=53) had to use Ning. Results showed that Twitter users had significantly higher scores in engagement and grades than the control group (Ning). Study 2 of [JEH13] examined the effects of optionally using Twitter to collaborate within the class. 66 students used Twitter, 69 students did not use it. Comparing Twitter users and non-users, no significant differences were found.

Sullivan [Sul12] described potential benefits of using Twitter as a teaching tool in Chinese politics classes and addressed some problems (e. g., governmental regulation of online information flow). However, despite the well-known restrictions in place on the Chinese internet, the results showed that Twitter usage enabled a stronger student engagement and empathy with the subject.

Charitonos et al. [CBSJ12] analyzed the Twitter stream of a Year 9 History class (29 children) on a school trip to the Museum of London. Findings showed that using Twitter improved students' engagement, impressions, participation and enthusiasm during the school trip. Furthermore, the online interaction via Twitter fostered collective experience and meaning.

Johnson [Joh11] examined the impact of the information type (social and/or scholarly) on the perceived credibility of the corresponding instructor. An experiment with 120 undergraduate students in a small U.S. college revealed that participants who viewed only social tweets rated the perceived credibility of the instructor significantly higher compared to solely scholarly tweets or a combination of social and scholarly tweets.

Stieger & Burger [SB10] investigated the use of Twitter for evaluation purposes of teaching quality by an experimental design (n¹=26, n²=40). Comparing formative and summative evaluation results, findings suggested that Twitter is a useful tool for evaluating courses formatively.

Lowe & Laffey [LL11] analyzed students' experiences of using Twitter as a tool to facilitate learning in marketing courses. Using in-depth interviews and a questionnaire to evaluate the learning outcomes of 123 students on a postgraduate marketing course, the study provided evidence that Twitter usage enhanced the learning outcomes in the course for the Twitter followers.

Rinaldo, Tapp & Laverie [RTL11] also investigated the use of Twitter within marketing courses. Capturing both quantitative and qualitative data in three studies (n¹=126, n²=130, n³=22) from students in an upper level consumer behavior course the results emphasized the positive impact of Twitter use on education goals such as a collaborative working atmosphere.

Wright [Wri10] reported on a case study with eight participants during a teaching exercise. The participants had to tweet about their experiences concerning the facilitation of Twitter for teaching purposes. Conducting a content-analysis of the tweets, the establishment of a sense of community was identified as the most important advantage of Twitter utilization.

Elavsky, Mislan & Elavsky [EME11] examined the outcomes produced by Twitter usage in a large-lecture course. Employing a mixed-method approach, results primarily discussed methodological limitations when investigating the transformation of social patterns by new technologies such as Twitter. However, results indicated general positive learning effects of Twitter usage in lectures.

Lin, Hoffman & Borengasser [LHB13] analyzed Twitter usage by undergraduate and graduate students in three classes (n=44) concerning the students' perception of Twitter as a classroom tool. It was found that students enjoyed being consumers of tweets but seldom re-tweeted or replied. The results further indicated that the incorporation of Twitter in lectures requires a careful course design.

Johri et al. [JTL+13] analyzed the social media usage for educational purposes employing a questionnaire for 204 students in a large public U.S. university in 2009. Since the use of Facebook was intensive, Twitter was only applied to a limited extent for educational purposes.

5 Discussion

Despite one study presented by Johri et al. [JTL+13], the results from all other 16 studies indicate positive outcomes when using Twitter in education and learning. However, as the work by Tiernan [Tie13] and by Elavsky, Mislan & Elavsky [EME11] pointed out, an appropriate methodological research design is crucial to achieve substantial objective research results. As shown in table 2 most of the studies (47%) were based on an experimental design which is very sensitive to investigator influences. Nevertheless, two studies were based on observations minimizing influencing effects. Just one [JTL+13] of these observation-based studies revealed the factually limited Twitter usage by students for learning and educational purpose, though four case studies (24% of all studies) explicitly describing the environment were also presented and coherently indicated positive learning outcomes when using Twitter. As the studies took place in 10 different majors, this result seems to be major-independent. However most of the investigations were operated in the United States, indicating the need for future research in other countries.

Besides the general positive Twitter usage – learning outcome relationship, more detailed findings can be revealed: Another positive effect of Twitter usage was found by both Rinaldo, Tapp & Laverie [RTL11] and Wright [Wri10]. Both studies revealed a collaborative working atmosphere facilitating the sense of community when utilizing Twitter. But the strong effect of community building may lead to group thinking as Kassens-Noor [KN12] found.

Table 2: Research methods, majors/subjects and explanatory notes of the identified Twitter-related research on education and learning

Reference	Method	Major	Explanatory notes
[JTL+13]	Observation	Engineering	Social media employment for educational purposes
[LHB13]	Case study	Information sciences	Students' perception of Twitter as a classroom tool
[FBH12]	Field study	Diverse	Twitter utilization for scholarly purposes in Israel
[LL12]	Experiment	Language	Content analysis of tweets from an intermediate French class
[JHL11]	Experiment	Health	Effect of Twitter use on college student engagement and grades
[Ve12]	Field study	Diverse	Content analysis of tweets from 45 important scholars
[DL09]	Case study	Design & technology	Social presence in online courses
[JEH13]	Experiment	Health	Impact of Twitter use on college student engagement/ outcomes
[CBSJ12]	Case study	History	Analysis of the visit's tweets on a school trip to a museum
[Sul12]	Observation	Politics	Benefits of using Twitter in teaching Chinese politics
[Joh11]	Experiment	Diverse	Analysis of the effect of tweets on instructor credibility
[SB10]	Experiment	Diverse	Twitter usage for course evaluation
[LL11]	Experiment	Marketing	Twitter adaption and learning outcomes
[RTL11]	Experiment	Marketing	Twitter usage and learning outcomes
[Wri10]	Case study	Education	Content analysis of tweets concerning teacher education
[EME11]	Mixed-method	Diverse	Twitter outcomes in large-lecture courses
[KN12]	Experiment	Urban planning	Experiment if Twitter usage aids students in learning

From the communication perspective the studies of Veletsianos [Vel12], Forkosh-Baruch & HersHKovitz [FBH12] and Lin, Hoffman & Borengasser [LHB13] found that Twitter was primarily utilized in an unilateral "assimilation mode". But it is well-known that real communication needs bilateral messages. In addition, Forkosh-Baruch & HersHKovitz [FBH12] found relatively high dropout rates from personal Twitter accounts, also indicating disengagement risks.

Last but not least, since there is a relationship between perceived instructor credibility and positive learning outcomes, the results of Johnson [Joh11] indicated the need to tweet social content by the class instructor.

6 Conclusion

Replying to recently formulated (IS-)research calls (e.g. [CBSJ12, KN12, Tie13, OMOR13, Tes13, HC13]) I reviewed in this article all existing 'substantial' scientific Twitter-related work containing evidence-based empirical learning and education material. Based on the results of the 17 corresponding identified studies I built up a comprehensive literature review.

As one major result, I coherently found a stable positive Twitter usage – learning outcome relationship. However, it is remarkable that the current state of research does not contain quantified relationships or general rules and above all, no theory models – indicating the need for future research concerning theory building, structural equation models, etc.

6.1 Limitations

I reviewed only Twitter-related work, not microblogging solutions in general. Thus, the findings of this review only apply to the specific microblogging solution Twitter and can not be fully generalised to all microblogging phenomena.

In addition, in this review I only considered international peer reviewed publications (journal articles and transactions) with completed research work. For quality reasons, poster sessions, editorials, interviews, commentaries, conference proceedings (with the exception of ICIS, ECIS, AMCIS), and research-in-progress papers were not included. Because of this restriction, a few publications containing interesting material were potentially missed in this review.

6.2 Future Work

In order to deepen our understanding of Twitter usage in educational and learning environments future work should

- further investigate the consumption and dropout problem as indicated in [Vel12, FBH12, LHB13],
- systematically extend learning-related Twitter usage studies to other countries than the U.S., and
- finally, fostering theory-building as a next step.

In the future research should extend the investigation to other or rather all microblogging solutions to consider different social network perspectives (e.g. [PHB12]).

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