Tweeting for Class: Co-Construction as a Means for Engaging Students in Lectures

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ABSTRACT
Motivating students to be active learners is a perennial problem in education, and is particularly challenging in lectures where instructors typically prepare content in advance with little direct student participation. We describe our experience using Twitter as a tool for student "co-construction" of lecture materials. Students were required to post a tweet prior to each lecture related to that day's topic, and these tweets – consisting of questions, examples and reflections – were incorporated into the lecture slides and notes. Students reported that they found lectures including their tweets in the class slides to be engaging, interactive and relevant, and nearly 90% of them recommended we use our co-construction approach again.

Author Keywords
Education; Twitter; Engagement; Lecture; Co-construction.

ACM Classification Keywords
H.5.3 Group and Organization Interfaces

INTRODUCTION & BACKGROUND
Today's undergraduates – members of the "millennial generation" – are particularly motivated by opportunities to customize their experiences with media, consumer products, and learning [10]. As such, engaging and motivating undergraduates can be difficult in traditional lecture formats [1], where there may be few opportunities for direct customization, especially when slides and materials are reused from year to year. This becomes even more challenging as novel courses, such as the recent boom in Massively Open Online Courses (MOOC) (e.g., [5]), expand the traditional classroom to include audiences of thousands.

Student engagement is defined as the level of energy students devote to in-class and out-of-class activities linked to desired outcomes, and has been shown to be a key factor in learning [6]. According to connectivist theories of learning (e.g., [9]) that underlie many online courses such as MOOCs, learning is best enabled by allowing students to pose questions, share ideas and discover connections between concepts.

In addition to MOOCs that are exclusively or primarily online, there has been substantial research on using social media tools (e.g., clickers, online discussion forums, blogs, Facebook groups and chat rooms) to increase opportunities for student engagement in traditional classes [2, 3, 8].

Clickers, for example, allow students to respond to instructor-posed questions during class. These give the instructor substantial control, but only permit sharing aggregated student responses with the entire class. A wiki-like approach to course construction, on the other hand, motivates students outside of class and allows them to contribute, but may be less appropriate for classes where certain content or ideas must be covered as a foundation for later coursework.

Blogs or other long-format online forums are a common hybrid and allow students to present their own ideas and content. However, integrating these into classroom discussion can be difficult for instructors due to constraints on time and space in formal lectures and presentations.

Microblogging sites (e.g., Twitter), facilitate a unique hybrid, which we conceptualize as "*co-construction.*" The goal in co-construction is to facilitate direct student engagement with each other and the content [9], but also allow for editorial control by the instructor and incorporation of students' contributions in a traditional lecture.

Twitter works well for this because it constrains messages to 140 characters and compiles them into one feed, which allows for public, continuous and real-time conversation [4]. Short student contributions can be quickly read by instructors and easily incorporated into lecture materials such as slides. Twitter is also easily accessible and widely used, so experience with it is a practical skill. Previously, Twitter has been used in teaching contexts to enable backchannel discussions during class, deliver reminders and announcements, stimulate discussions, and increase interaction opportunities [3, 4].

For our course, a 150-student undergraduate lecture that two of us teach (in alternating years), we used Twitter for what [7] refers to as meta-cognitive and reflective activities, such as articulating difficulties or applying key concepts. We developed a teaching model that integrated Twitter in a

particular type of "co-construction" of lectures. We had three goals, related to student engagement: 1) make lectures more relevant to students by incorporating questions and examples, 2) improve student preparation for class by motivating reading and thinking outside the classroom, and 3) provide new ways to participate via customizing slides.

To accomplish these goals, we had students post tweets prior to each class that were related to that day's topic. We then integrated these directly into the lecture slides and materials. Importantly, we used Twitter alongside assessment tools such as exams and homework essays. We report here on Twitter, but note that it was not the only way students interacted with the material and each other.

METHOD

Research Context: How We Used Twitter

Our course is a 150-student lecture on communication technology at a large university in the northeast United States. The course primarily draws students majoring in Communication and Information Science, plus a range of students from other majors. Students typically are assigned to read one book chapter or empirical study prior to each lecture, and this reading is the focus of lecture.

By midnight on the night before each lecture (i.e., twice weekly), students had to submit one tweet related to the day's assigned reading. It could be an observation, reflection, question, or anything they deemed on-topic.

Tweets were submitted from course-specific Twitter accounts set up by each student. This simplified access to tweets for us and preserved student privacy. To collect student tweets, we set up a separate Twitter account that compiled the tweets in one public feed using GroupTweet, an application which retweets all tweets sent to the class account and made them visible to all students in the class.

After the deadline, one teaching assistant created a "Tweet Report," which was sent to the instructors. This contained all of that day's tweets, a Wordle visualization of all words used in the tweets (sized according to use frequency, see Figure 2), and a curated set of tweets illustrating common themes, key concepts, and questions or points of confusion.

Before class, the professor used the Tweet Report in assembling the day's lecture slides, including content directly from the tweets. The tweets helped us in three key ways: 1) "troubleshooting" student understanding, 2) illustrating key concepts, and 3) including student questions. Tweets appeared in a colored rectangle (Figure 1) to distinguish them from instructor-generated content.

Identifying information has been removed from tweets in this paper, but those used in class usually had students' usernames attached to them unless it could embarrass the student publicly (i.e., if it revealed a misunderstanding).

Research Methods

We base this paper on our experience in teaching this course three times, responses to a questionnaire at the end of 2009 and 2010, and content coding of tweets from all three years. The questionnaire had 42 items about student experiences with Twitter, using it for class, and perceptions of its effects. Items most relevant to our research goals here are shown in Table 1, with other items measuring factors not discussed here directly. Scales had not been formally validated, but accurately reflected informal feedback we received from students and was consistent from year to year. Most items used 5-point Likert scales anchored by "strongly agree" (5) and "strongly disagree" (1). There were also free-response items inviting general comments. Students received 1 extra credit point for completing the questionnaire. To avoid possible positive response bias, they were told (truthfully) that data would not be analyzed until grades were submitted. 173 students (of 180 enrolled, 86 Female) completed the 2009 questionnaire, and 111 (of 137 enrolled, 61 female) in 2010.
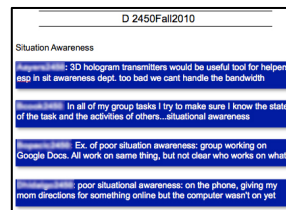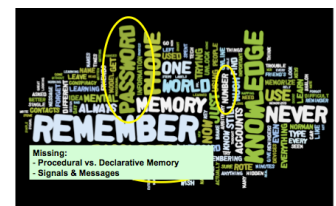

Figure 1. Slide with Tweets   **Figure 2. Wordle visualization**

Content coding of tweets from all years was done in summer 2012. The data set included 9180 tweets (3657 from 2009, 2456 from 2010 and 3067 from 2011, with enrollment accounting for variance). Three coders coded the tweets, with each tweet coded by two of the coders. Coders iterated on subsets of tweets until agreement was better than 80%. Coding categories included: examples/applications of concepts, questions, comments on the reading content (without application or questions), comments on the course structure/logistics, comments directed at other students (i.e., '@ replies'), jocular comments intended purely for humor, and those that did not fall into one of these categories.

RESULTS

On the whole, students were enthusiastic about co-construction via Twitter. When asked if they recommended future Twitter use , 93% (2009) and 86% (2010) approved.

Making Lecture More Relevant and Interesting

Our first goal was to make lectures more interesting and relevant, ideally also helping students understand course concepts. We measured this in several ways.

	2009 (N=175)			2010 (N=111)		
	Disagree	Neutral	Agree	Disagree	Neutral	Agree
I enjoyed seeing my own and classmates tweets	5%	6%	89%	5%	4%	91%
Tweets made class more interactive	6%	9%	85%	6%	9%	85%
Answering tweeted questions was helpful	4%	7%	89%	5%	8%	86%
Examples in tweets helped me grasp concepts	3%	15%	81%	9%	12%	79%
Overall I enjoyed discussion of tweets	5%	10%	85%	9%	9%	82%

Table 1. Questionnaire results (full scales compressed to 3 categories)

First, 81% of students in 2009 and 79% in 2010 felt that our incorporation of examples and explanation from the tweets helped them grasp course concepts (see Table 1). We also examined their free-response comments. Many appreciated the perspectives of their fellow students, feeling their peers offered insights on understanding a difficult theory:

> Really was a tool to explain what the readings were saying. The class tweets that were put up helped make a complicated theory more clear and to the point.

This student said tweets raised issues she hadn't considered:

> Other people would bring up problems or examples that I hadn't recognized, which would help me get a better grasp of the material.

Second, this comment reflects that in most tweets (2009: 57%; 2010: 68.6%; 2011: 62.6%), students applied course concepts to examples from their lives. This got them thinking about how to apply concepts, and enabled us to use examples that were likely to be relevant to students.

Twitter also commanded student attention during lecture, particularly as they watched for the appearance of their own and others' tweets: 92% of 2010 and 89% of 2009 students reported that they enjoyed seeing their own contribution to lecture materials. We also observed students quietly cheering or taking photos of their tweets when they appeared on the slides. As one student noted:

> The best thing about tweeting was seeing your own tweets in class. It made you feel famous.

Students also reported that tweets helped make the lecture slides more understandable as they studied for exams.

Improving Preparation and Non-Classroom Time

Our next goal was to improve use of non-classroom time. To understand how our co-construction technique affected this goal, we examined student comments about their tweeting behavior. In terms of improving preparation for lecture, many students reported that one of the strengths of Twitter was that it encouraged them to keep up with readings and engage with the material actively. As this student notes:

> Tweeting really made me keep up with the reading. Made me not just read passively, but actively think about it enough to be able to tweet.

Many others appreciated that it was a low-effort assignment that motivated them to understand some of the material:

> Quick assignment that is not difficult and motivates me to understand at least one of the concepts before each lecture so that I can tweet about it.

This was reflected in the tweets themselves, as the majority were examples of class concepts. An additional fraction (2009: 27.1%; 2010: 20.4%; 2011: 21.3%) were related to readings, but did not include examples. Some students said, however, that reading with an eye toward tweeting sometimes meant not focusing on the entire article:

> Sometimes I would focus on what I would tweet about more than the reading. Once I found an interesting topic to tweet it was hard to stay focused and finish reading the whole article.

In terms of getting students to think about the material, their tweets clearly indicate that they were applying course concepts to their experiences. Here, a student discusses her Facebook ("fb") behavior in terms of the impression formation research covered that week in class:

> *i hate to admit that I "fb stalk" but now everyone makes judgments off of fb profiles (doesn't matter if I've met you yet).*

Another talks about the downfalls of communicating with reduced contextual cues, an important concept covered in the class:

> *I have gotten into unnecessary little fights with friends over taking something that was texted the wrong way.*

Other examples were extremely concise, but indicated clearly that students understood and had thought about a concept, as in this student's brief tweet on "critical mass:"

> *RIP GOOGLE WAVE #criticalmassproblem*

Providing New Ways for Students to Participate

Our third goal in experimenting with Twitter was to enable new ways for students and faculty to interact. On the whole, students took advantage of and appreciated this opportunity, as the vast majority of tweets were deemed relevant to the course (2009: 98.5%; 2010: 98.3%; 2011: 97.7%).

Participation occurred in three ways: direct questions for the instructor, instructor reading of student tweets, and student suggestions about the course.

As Table 1 shows, 85% (both years) of students felt incorporating tweets made class more interactive; and 86% (2010) and 89% (2009) of students felt featuring and answering Twitter questions in class was helpful. Student comments also reflect this, as indicated by this student:

> The best thing about tweeting was being able to ask questions in a huge class. In most lectures that are as large as <course>, individual concerns/opinions are not heard, and tweets really enabled us to interact with one another and <instructor> in a more intimate way than one would expect for such a large lecture.

Despite these positive perceptions, however, a relatively small fraction of tweets were questions (2009: 12.8%; 2010: 7.4%; 2011: 10.6%). Still, even with the 140-character limit, students were able to ask substantive questions, as in this case about deindividuation effects:

> *Are the depersonalization and deindividuation effects measured by degree? It seems like it would depend on the CMC medium.*

There was also some limited evidence of students interacting with each other. Interestingly, this increased substantially over time. In 2009 and 2010, student-directed tweets consisted of 0.4 and 0.5% of tweets, respectively. In 2011, this increased to 2.1%. While still a small fraction, this is a substantial increase; possibly due to increased student familiarity with Twitter conventions.

This was also reflected in student feedback. One student appreciated the ability to interact simultaneously with peers and the instructor:

> Tweeting allowed us to talk about our questions with the material, while notifying the professor at the same time. It allowed us to really get into it.

The key point here is that students used Twitter as a way to interact with each other as well as instructors.

The second way that Twitter enabled novel student-instructor interactions was that instructors could use the content of tweets to assess student (mis)understanding. Some tweets in the example/application category allowed us to see cases where students believed they understood the material, but were actually misinterpreting it. These misunderstandings traditionally wouldn't surface until after homework or exams are graded. In these cases we could display the tweet anonymously and clarify the concept.

A third mode of participation involved students providing feedback about course details on a much more regular basis than is enabled by typical end-of-term feedback. This was a very small number of tweets proportionally (2009: 1.1%; 2010: 1.5%; 2011: 1.2%), but the suggestions were helpful. Some students, for example, thought the text was outdated:

> another example of how dated the book is-"there won't be any film, just videotape"...or now DVDs and blu ray?

Finally, the Wordle provided a way for the class to interact in the aggregate with the instructors. It provided a concise visual snapshot of what students were thinking as they tweeted, and importantly, what they were avoiding (see Figure 2). In these cases, we could open the lecture by asking "Does anybody notice anything missing from today's Wordle?" and then discuss why a concept or topic was absent, often because it was poorly explained in the readings. In some ways, this is similar to using clickers, but the Wordle provided a more diverse range of responses.

DISCUSSION
First, we note that students were enthusiastic about using Twitter and having a role in co-constructing the lecture. In their own words, this motivated them in preparing for and during class, and also led to perceptions of better understanding and inclusion of more relevant material. Thus, our goal of improving engagement was realized.

Twitter provided an infrastructure for sending, receiving and aggregating short messages that were easy for the instructors and TAs to read quickly and incorporate into lecture. In this way, the 140-character limit was critical. While students were sometimes frustrated by this limit, we feel that the large number of effective tweets is testament that this was not a debilitating constraint. At the same time, one would need other ways to engage students for more difficult questions or exploration of concepts.

In addition to allowing for more direct involvement, tweets also provided us with another avenue for assessing student understanding of the content. We found this to be helpful in tailoring content to the students' specific needs, and in being able to do so prior to the start of a class period.

We also found that Twitter was not very effective at getting students to interact with each other. This is likely the partial result of an incentive scheme requiring only one tweet per lecture and the clear desirability of having one's tweet selected by the instructor for the day's slides. These parameters could be experimented with to encourage more interaction among students in future work.

Another limitation to this work is that co-construction as presented here was effortful, as tweets had to be manually parsed. This clearly would not scale directly to a MOOC scenario. We believe, however, that a combination of automated text analysis and letting students read and rate others' tweets would allow scaling and provide a useful way to engage a large population of lecture participants.

In interpreting our results, it is also important to consider that our design relies on self-reported data and had no control case for experimentally assessing impact on student performance. This would be useful in future work.

REFERENCES
1. Astin, A. Student involvement: a developmental theory for higher education. *Journal of College Student Personnel*, 25(1984), 297-308.

2. Chen, P. S. D., Lambert, A. D. and Guidry, K. R. Engaging online learners: the impact of web-based learning technology on college student engagement. *Computers & Education*, 55(2010), 92-100.

3. Ebner, M., Lienhardt, C., Rohs, M. and Meyer, I. Microblogs in higher education – a chance to facilitate informal and process-oriented learning. *Computers & Education*, 55(2010), 92-100.

4. Junco, R., Heiberger, G. and Loken, E. The effect of Twitter on college student engagement and grades. *J. of Computer Assisted Learning*, 27(2011), 119-132.

5. Lewin, T. *Instruction for masses knocks down campus walls*. *New York Times*, March 5, 2012, p. A11.

6. Pascarella, E. T. and Terenzini, P. T. *How College Affects Students: A Third Decade of Research*. Josey-Bass, San Francisco, CA, 2005.

7. Sample, M. A Framework for Teaching with Twitter. *Chronicle of Higher Education*, 2010.

8. Schroeder, A., Minocha, S. and Schneider, C. The strengths, weaknesses, opportunities, and threats of using social software in higher and further education teaching and learning. *Journal of Computer Assisted Learning*, 26(2010), 159-174.

9. Siemens, G. Connectivism: A learning theory for the digital age. *International Journal of Instructional Technology and Distance Learning*, 2, 1 (2005).

10. Tapscott, D. *Grown up digital: How the net generation is changing your world*. McGraw-Hill, 2009.