

Twitter's Effects on Student Learning and Social Presence Perceptions

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Social presence, the concept that individuals have a sense of others as “real people” in mediated communication, is a pivotal concept in online interaction and learning. Social presence theory suggests that social media tools, such as Twitter, should build community among groups such as students. This could affect how much students learn. In this study, participants in a quasi-experiment ($N = 76$) completed supplemental class exercises for a mass communication course, either by conversing with classmates on Twitter or by individually writing essays. Participants who used Twitter had more positive perceptions of Twitter as a classroom tool, and these students had greater social comfort with their classmates. Twitter use for class discussion did not correlate with higher scores on objective questions testing students' memory of class content.

Mass communication educators are preparing students to use social media in their careers, so educators must wrestle with integrating social media tools into the classroom. The question of classroom social media use is particularly relevant for mass communication faculty. Social media use is not just a matter of technological innovation for the sake of pedagogy but an increasingly important professional skill for journalism and mass communication graduates. The purpose of this study is to examine the impact of Twitter on students' learning and perception of social presence. In the last decade, Web services such as wikis, blogs, and podcasts have created opportunities for people to produce, seek, or share information across the globe. Consequently, communication and collaboration have become much easier and common, especially through blogging (Reinhardt, Ebner, Beham, & Costa, 2009).

The word “blog” calls to mind a specific site maintained and updated by one person, but microblogging is a popular form that brings together the comments of many people. Microblogging usually consists of short and succinct messages to share news, post status updates, and interact with like-minded people. Facebook and Twitter are two popular weblogs with millions of members who produce and share information regularly. Microblogging has witnessed a tremendous growth in the last three years and is noted for its fast exchanges of ideas, thoughts, and information (Ebner & Schiefner, 2008).

Twitter was established in 2006 and has grown exponentially. The site went from having 2.7 million unique visitors in December 2008 to 40.4 million in December 2011 (Compete, 2011). Users can send tweets of up to 140 characters that can be posted on the Twitter website or applications for mobile phones and

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computer desktops. Twitter allows users to follow the posts of others, so users can use this microblogging platform for better networking and sharing of knowledge with friends and followers (Java, Song, Finin, & Tseng, 2007). Twitter also allows users to attach clickable tags to tweets so that the site's content is searchable and linked by topics. This technique has proved extremely useful when contributing and sharing information about a specific topic (Stevens, 2008).

Twitter has been used for educational purposes, as well, and studies have explored whether out-of-classroom interactions significantly enhance students' learning, interpersonal relationships, and perception of social presence (Dunlap & Lowenthal, 2010; Rinaldo, Tapp, & Laverie, 2011; Sweetser, 2008). Social presence is a conceptual framework that explains the capability of people to project themselves as "real people" in mediated communication. Social presence is defined as a communicator's sense of awareness of other participants in an online community, and it plays a pivotal role in computer-mediated communications and online learning.

This study examines how students respond to using Twitter in a classroom assignment. It measures students' performances on test questions, perceptions of social presence, and perceptions of Twitter's usefulness in the classroom. Instructors already are using Twitter in classes to encourage students to discuss course material and complete assignments. There is, however, little empirical evidence that supports the effectiveness of Twitter in enhancing perceptions of social presence and learning. This study aims to contribute to the gap.

LITERATURE REVIEW

This study adopts its literature from the areas of social presence and computer-mediated communication. Social media, a form of computer-mediated communication, are inescapable in today's digital world. A critical factor in developing effective communication in computer-media environments is social presence. Short, Williams,

and Christie (1976) explained social presence as the ability of people to present themselves as "real" in a communication medium.

In the earliest research study on social presence, it was associated with the concepts of immediacy and intimacy (Short, Williams, & Christie, 1976). Immediacy refers to psychological cues, such as smiling and nodding, which enhance closeness with others. Level of intimacy includes verbal statements and nonverbal behavior, such as eye contact and body language. Intimacy and immediacy increase the perception of social presence (Gunawardena, 1995). Three themes bind the various definitions of social presence: 1) Being together, which includes elements such as co-presence and mutual awareness; 2) psychological cues, such as immediacy, intimacy, and making oneself known in the community; and 3) behavioral interactions (Biocca, Harms, & Burgoon, 2001).

Researchers such as Gunawardena (1995), Richardson and Swan (2003), and Rovai (2002) established the relationship between social presence, satisfaction, and perception of belonging among students. Results such as these have encouraged instructors to create and maintain social presence in online education to enhance student satisfaction and learning. Frequent, prompt feedback and use of audio and video elements are methods that establish social presence in online courses (Aragon, 2003) since these simulate interpersonal experiences. Multimedia presentations aren't required to create a sense of social presence, though. DuVall, Powell, Hodge, and Ellis (2007) found that frequent usage of text messaging could improve the perceptions of social presence. Although text messages are sent by mobile phones, the process of communicating through text messages is structurally similar to an online interaction using chat or discussion board services.

Social Media and Learning

Most studies that have looked at social presence and learning have observed that educational

management services, such as Blackboard and e-Learning, can create and enhance the perceptions of social presence among students through their communication tools, such as discussion boards, e-mails, and chatting services (Dunlap & Lowenthal, 2010; DuVall, Powell, Hodge, & Ellis, 2007). However, a major drawback of these management services is that the users have to log in and navigate to engage in discussion, sharing, and collaboration. This type of interaction is forced and also loses the informal and free-flowing (Dunlap & Lowenthal, 2009) communication process that students have with classmates and instructors.

Social media enable informal interactions among people. Junco, Heiberger, and Loken (2011) explained social media as Web services that enable collaboration, participation, and information sharing. Services such as blogs, microblogs, social networks, wikis, and video sharing sites now make regular appearances in learning environments. Social media enable social networking, and these types of sites, such as Facebook, MySpace, Twitter, and Orkut, have become an integral part of the lives of students and faculty (Junco, Heiberger, & Loken, 2011). Twitter has particular potential to establish and maintain social presence because it can mediate a type of discussion and interactive dialogue similar to educational management services like Blackboard, but the discussions tend to be more informal.

Faculty members are using Twitter in courses to enhance student learning (Dunlap & Lowenthal, 2010; Junco, Heiberger, & Loken, 2011; Rinaldo, Tapp, & Laverie, 2011). Luehmann and Tinelli (2008) found that blogging helped like-minded people engage in academic discourse. They further concluded that blogging enabled collaborative interpretation, encouragement, and advice through comments left by readers and fellow bloggers. This shows the importance of social media in learning and collaboration.

Weisgerber (2009) argued that students need to be prepared for a changing media landscape

and suggested extensive use of wikis and blogging to improve students' proficiency with these technology tools. Moody (2010) suggested that social media technologies could help instructors communicate with students and vice versa, fostering a rich discussion and encouraging students to think critically. Moody suggested integrating Twitter in classes to encourage students to follow current events on Twitter so they could engage in critical discussion. Students expressed a greater sense of engagement in class when they used Twitter, and Twitter had a positive effect on student engagement (Junco, Heiberger, & Loken, 2011). The researchers also found that Twitter use for educationally relevant purposes had a positive effect on grades. Hence, the following hypothesis is constructed:

- H1.** Students using Twitter will score higher on the information retention questions on a post-test than students who did not participate in Twitter discussions.

Factors of Social Presence

Researchers have struggled to measure social presence because of its various conceptual definitions. Lin (2004) went beyond previous measures of social presence (Gunawardena, 1995; Rourke, Anderson, Garrison, & Archer, 2001; Tu, 2002) to find factors that better explain social presence. He created a 20-item scale from which he extracted three factors: social comfort of expression, perception of the value of group activity to learning, and social navigation. This scale's construct validity and variance among the factors makes it a desirable tool for measuring social presence. The current study looks at social comfort of expression and perception of the assistance of group activity to learning factors.

Wegerif (1998) said that students needed to feel part of a class community in order to avoid anxious, apologetic, or uncollaborative attitudes. Sense of community comes from social comfort and trust (Hughes, Wickersham, Ryan-Jones, &

Smith, 2002). Students feel more social comfort when they play a multiplayer online game at the beginning of the semester (Lowell & Persichitte, 2000) or represent themselves visually on a Web page (Palloff & Pratt, 1999). Social media technologies and sites, such as Facebook and Twitter, provide even easier ways to increase social comfort, particularly for students who are too shy to talk to their classmates (Moody, 2010).

Students working in groups tend to be more involved, learn more, and retain knowledge longer than when learning under other circumstances (Springer, Stanne, & Donovan, 1999). Gokhale (1995) observed that constant exchange of ideas within groups increases interest among the students, thereby increasing their ability to retain information. Group activity gives students an opportunity to engage in discussion, which improves their level of involvement (Totten, Sills, Digby, & Russ, 1991). Johnson and Johnson (1999) reported that collaborative learning also provides opportunities for developing communication skills and social skills, and building positive attitude toward group members and study material. Although past studies have identified elements such as group size, group composition, and learning styles as factors that influence collaborative learning, social interaction seemed to be the essential element to influence the effectiveness of group activity in collaborative learning.

Tu (2000) found a significant association between students' perceived social presence and their interaction with online group members. Furthermore, there is a positive association between learner-to-learner interaction and students' motivation toward learning (Moore & Kearsley, 2005). So, students need to interact with their peers to be perceived as being there and real.

The previous literature made the case for the importance of social comfort of expression and for the usefulness of group activities in learning. These suggest the following hypotheses:

- H2.** Students using Twitter will report higher social comfort of expression compared to the students who do not use Twitter.
- H3.** Students using Twitter will display a more positive perception of group activity toward learning than students who do not use Twitter.

As discussed earlier, social presence and student satisfaction have been linked (Gunawardena, 1995; Richardson & Swan, 2003). Richardson and Swan (2003) found that students who reported a greater degree of social presence were highly satisfied with their instructor. They also found an association between student satisfaction with their instructor and perceived learning. Russo and Benson (2005) found a significant relationship between student satisfaction and the perceived presence of other students. This result emphasizes the importance of establishing and maintaining social presence in online learning environments. Almost two-thirds of students preferred classes that heavily used instructional technology (Buzzard; Crittenden, V.; Crittenden, W.; & McCarty, 2011).

Picciano (2002) found a significant relationship between social presence and quality of learning. He found that it was not the quantity but the quality of learning that had a strong association with social presence. However, few empirical studies examine the relationship between social media and learning. Therefore, a research question has been asked to understand students' perception toward Twitter's usefulness in learning.

- RQ1.** Do students who use Twitter exhibit a more positive opinion of its usefulness in learning at the end of the study than students who do not participate in Twitter discussions?

METHOD

The current study uses a between-subjects, quasi-experimental design to vary whether students

used Twitter as a supplemental learning activity. All participants were among the 175 students in a single lecture course at a southwestern university, and they were randomly assigned to one of two groups. The first group completed an assignment relevant to course content by posting comments on Twitter and joining in discussion with other classmates there. Members of the second group completed the same assignment objectives by individually writing an essay. Participants were sent an e-mail message with a link to a pre-test questionnaire and then asked to participate in their assigned activity over the next class week; they then received an e-mail link to a post-test questionnaire.

Participants

Participants ($N=96$) signed up to participate in the study for extra credit in an undergraduate introductory electronic media class in fall 2010. The extra credit allowed the students to replace a low quiz grade and had a maximum effect of a 2% increase to the final course grade. The students were randomly assigned to two equal-sized groups. Twenty students failed to complete all questionnaires and required elements for the study. The final group of 76 students was 59.2% male ($N = 45$); the mean age was 21.3 years ($SD = 3.22$). The final number of participants in the group that used Twitter ($N = 41$) slightly outnumbered the participants in the control group ($N = 35$).

Instrument

Participants completed a pre-test questionnaire online. The first section of the questionnaire consisted of six Likert items to assess how useful participants perceived Twitter to be in the classroom. The perceived usefulness scale was developed by Davis (1989) for information technology use at work and was adapted for an educational context. These items used a 7-point response scale and prompted participants to indicate the degree to which they agreed with each statement. Partici-

pants responded to statements such as, "Using Twitter would improve my class performance."

The second section of the questionnaire consisted of five semantic differential items designed to assess participants' attitude toward Twitter in the classroom, adapted from Ivory & Kalyanaraman (2007). The statement, "All things considered, my using Twitter for class is..." prompted participants to rate five dimensions on a seven-point scale, using anchors such as "Good/Bad" and "Beneficial/Harmful."

The third section of the questionnaire consisted of 10 objective multiple-choice questions that tested participants' recognition of material presented in class lectures that week. All questions for this section of the questionnaire were created from course material that was covered during normal class proceedings. Course lectures during the week of the study focused on social media. Questions included: "Which organization(s) has/have fined or fired employees or members based on content posted to a blog?" and "What was one of the most popular shared concerns and public discussions when social networks gained wide acceptance?"

These items were included in the pre-test and repeated in the post-test, which was administered by sending participants an e-mailed link at the end of the study. In addition to the previous items, the post-test also included 14 Likert-type items, designed to assess participants' perceptions of social presence (Lin, 2004). The social presence scale adopted for this study was slightly modified to correspond with Twitter usage. These items used a 7-point response scale and prompted students to indicate the degree to which they agreed with each statement. Participants responded to statements, such as, "I felt like I was a member of a group during the past week's activities," and "Actions by other members of my group usually influenced me to do further work."

The final section of the questionnaire consisted of general demographic items. These included gender, age, year in school, and amount of time spent online.

Procedure

Participants were randomly assigned to a group. All participants received a link to the pre-test questionnaire on November 5, 2010. Once participants completed the questionnaire, they received another e-mail message with instructions about their participation. Participants in the experimental group then received step-by-step instructions for establishing a Twitter account and a glossary of Twitter terms. They were given two goals to accomplish in their week of participation. They were instructed to comment as often as they liked on Twitter about points from class lecture or discussion that they found interesting or that they did not understand. Their second goal was to post at least one tweet that week with a link to a current news story, report, blog post, or similar content that was related to class content about social media that wasn't mentioned in class.

Participants were instructed to make at least 10 posts that week to contribute to class discussion on Twitter, and they received a hashtag (#emc3300) to include in all of their tweets for class so that their discussion would be easy to follow on Twitter. They were told to complete their comments by Sunday, November 14, 2010. They received a link to the post-test questionnaire that day. Participants in the control group received an e-mail message after completing the pre-test questionnaire, and they were asked to meet the same goals as the students in the Twitter group (to address class content they found interesting or confusing, and to provide a link to related material not covered in class). The control group's instructions included a link to a Web page where the participants were instructed to write two paragraphs in response to these goals. Like participants in the experimental group, the control group received an e-mail link to the post-test questionnaire on November 14. All participants were reminded of their task by a reminder e-mail after two days to ensure a higher response rate.

RESULTS

The scores of all three scales described in the instrument section showed reliability. For the usefulness scale scores, Cronbach's $\alpha = .97$; for the scale scores assessing attitude toward Twitter, Cronbach's $\alpha = .97$; for the perceptions of social presence scale scores, Cronbach's $\alpha = .94$.

A principal components analysis was conducted on the social presence scale. Mahalanobis Distance was calculated for each case and compared to the critical value of $\chi^2_{(.001, 8)} = 34.53$. One case was dropped as a result of this screening. The Kaiser-Meyer-Olkin measure of sampling adequacy was 0.89, or "meritorious." Three indicators guided the selection of the number of factors to extract. The initial principal components analysis revealed two eigenvalues greater than 1, with a fourth closely approaching 1 (0.98). The scree plot indicated two to three factors, and Horn's test, which uses random data with the same parameters as the sample, had six eigenvalues above 1 (Horn, 1965). Two- and three-factor solutions using orthogonal and oblique rotations were systematically tested using the principal axis method of extraction. A two-factor solution with direct oblimin rotation was the best solution. The pattern matrix shows the factor loadings (Table 1).

To test the hypotheses and the research question, a series of analyses were conducted. A MANOVA on the initial three pre-test scales (attitudes toward Twitter in the classroom, number of factual questions answered correctly, and usefulness of Twitter in a classroom setting) by group showed no statistically significant differences between the experimental group and the control group, Pillai's Trace $F(3, 72) = 2.28, p = .09$, partial $\eta^2 = .09$.

A MANCOVA on the objective knowledge score, attitude toward Twitter in the classroom, and perception of Twitter's usefulness in the classroom by treatment group with pre-test scores for these three scales as covariates was the primary analysis tool for H1 and RQ1. The test resulted in no statistically significant difference in scores

Table 1
Social Presence Scale Items

	Factor	
	1	2
This past week's online group activities helped me learn more efficiently than if I were working alone.	0.93	
This past week's online group activities helped me accomplish the assignment with higher quality than if I were working alone.	0.91	
Knowing what other members of the group did helped me know what to do.	0.89	
Actions by other members of my group usually influenced me to do further work.	0.88	
Knowing that other members of my group were aware of my work influenced the frequency and/or quality of my work.	0.87	
I felt I came to know the other students in this past week's online group activities.	0.77	
I was able to form distinct individual impressions of some group members during the online group activities.	0.62	0.26
I was able to appreciate the humor of members of the group.	0.53	0.35
I felt like I was a member of a group during the past week's activities.	0.47	0.35
I felt comfortable expressing my feelings during this past week's activities.		0.88
I felt comfortable expressing my humor.		0.85
I felt comfortable participating in this past week's online group activities.		0.81

on the objective knowledge questions between the groups, $F(1, 75) = 2.90$, $p = .09$, partial $\eta^2 = .003$. Therefore, H1 was not supported.

To examine the impact of Twitter on social presence (H2 and H3), an ANOVA on the two factors of the social presence scale by treatment group was conducted. The ANOVA showed significant differences on one factor but not the other. Participants in the experimental condition expressed a higher degree of social comfort ($M = 4.96$, $SD = 1.38$) than participants in the control condition ($M = 3.40$, $SD = 1.57$), and the difference between the conditions was significant, $F(1, 75) = 21.31$, $p < .001$, partial $\eta^2 = .22$. Although a multivariate analysis might have offered additional protection against Type 1 error, the level of significance does not suggest a need for concern about the issue in this case. H2 was supported. There was no statistically significant difference between groups on the perception of the assistance of group activity toward learning, so H3 was rejected.

Finally, the MANCOVA mentioned above was used to examine RQ1. Analysis revealed a small but significant difference in participants' assessment of the usefulness of Twitter in the classroom, $F(1, 75) = 11.83$, $p = .001$, partial $\eta^2 = .14$. Participants in the experimental condition had slightly more positive perceptions of the usefulness of Twitter in the classroom ($M = 3.02$, $SE = .21$) than participants in the control condition ($M = 2.58$, $SE = .23$).

DISCUSSION

This study investigated the impact of Twitter on learning, students' perception of social presence, and their assessment of the usefulness of Twitter in class. Students either discussed class content on Twitter or noted, in individual essays, the highlights they remembered from lectures. This study found no difference between the two groups in their scores on questions measuring memory for class content. This doesn't necessarily indicate that Twitter fails to affect student learning. Questions that were asked on the memory-based test were directly taken from in-class lecture content

to which both control and experiment groups were exposed. Perhaps the benefits of social media use are found for students in additional knowledge that Twitter users could accumulate from their classmates. Rather than just making their own associations about class content, they were exposed to the thoughts of classmates they might not have spoken with otherwise. Previous research shows that Twitter has the potential to motivate students to actively participate in class and also become active learners (Luehmann & Tinelli, 2008). This type of behavior may not be reflected in tests of recognition memory for lecture content.

Students may have reached the same conclusion. Social presence theory led to the prediction that participants using Twitter would perceive group activity to be valuable to learning when compared to the control group's perception of group learning in the class. This hypothesis was rejected. Research literature on collaborative and cooperative learning suggests that students actively get involved in the process of learning. Further, the findings of Johnson and Johnson (1999) suggest that collaborative learning enhances communication and social skills, and that it builds positive attitudes toward group members and learning. However, the current study failed to support these claims. Perhaps the brief period of the study did not allow students to feel that their participation in Twitter discussion had any effect on their class performance. Moreover, participants in the experimental condition were not given any major task-oriented activities to experience a higher level of group connectedness that leads to social presence. They had a general charge to discuss class content and share related information that had not been presented in class. Their discussion proceeded unmoderated, so they did not receive feedback from the instructor about the value of their contributions or any encouragement to stay on topic. They may not have seen their discussions as a way to reinforce class concepts and ultimately increase their understanding of the topic and result in a higher

grade. They didn't perceive their group discussion as valuable to learning, and it was not—if learning is only defined by performance on multiple-choice questions about lecture content.

Twitter's real benefit in the classroom may be for courses that already have a strong group-learning component or that push students to analyze and apply concepts. The implication is that it's just not enough to add a Twitter participation requirement to an existing course for the sake of innovation. This study indicates that this type of implementation will not enhance student memory for factual material or perception of value to learning. Faculty who expect these outcomes may be disappointed, but this study did show some clear benefits of using Twitter to enhance social presence.

The second hypothesis examined Twitter's effect on another measure related to social presence: social comfort of expression. Participants in the experimental condition reported a higher sense of social comfort compared to the participants in the control condition. This is not surprising, as social media have an ability to make users comfortable online. Tu (2000) argued that there is an association between peer group interaction and a sense of social presence. This argument validates the current finding. Further, participants from the experimental group were able to interact with other Twitter users and continued the interactions throughout the week, which created a sense of social comfort of expression. This finding sheds light on the importance of integrating Twitter in classrooms to achieve social comfort of expression among students. The practical benefit of this finding could be the ability to motivate students who are normally shy in class to actively participate in the online discussion. As Moody (2010) suggested, students who feel shy talking in front of their classmates may open up online. Social network sites such as Facebook, Twitter, and MySpace may enable shy students to be more interactive.

The current study's purpose of examining the effect of Twitter on student perceptions of social

presence resulted in a mixed outcome. Twitter succeeded in establishing and maintaining social comfort of expression among users. Students who had no opportunity or courage to speak in class had opportunities to speak their minds. Participants in this study were among 175 students enrolled in a lecture class. They had sat side-by-side three days a week for 11 weeks before this study began. The transcript of tweets from the students showed that before members of the experimental condition started discussing class content, they began the exercise by introducing themselves to each other through their tweets. Their previous physical proximity didn't equate to familiarity or comfort. A core group of students in the experimental group were the most active in the Twitter discussion for the study—and they continued using the #emc3300 hashtag to talk to each other on Twitter about the class after the study had concluded. Another anecdotal observation indicated that many students just enjoyed participating in a social media assignment. "Twitter has just made class way more fun!!" one participant wrote in a tweet. These anecdotal observations and the positive finding about social comfort among social media users is one of the most significant findings of the study. Integration of Twitter in classrooms will encourage students to actively participate in discussions and dialogue. Students simply may require some guidance and encouragement to make sure their discussions have pedagogical value. Students may sense the potential value of such exercises to their learning. In this study, participants in the experimental condition perceived Twitter as more useful in the classroom than did participants who didn't use Twitter. Participants from the experimental condition seemed to like using Twitter outside the classroom for discussing class content, sharing information, and interacting with classmates.

Limitations and Future Research

The one-week duration of this study likely limited the findings. Most social presence and learning research works have either used an entire

semester or a large sample to run the study. Using a relatively low number of students in just one class also limits the results. Different courses and instructors have different approaches to teaching and classroom management, and these variables could affect the effectiveness of any teaching tool. Increasing the number of participants and the number of sections and courses would give the results greater generalizability. As noted above, multiple-choice questions designed to test students' memory for class lecture content are only one measurement for the vast construct of learning. Different operationalizations of learning and class performance may be useful in future studies. In addition, researchers may choose to evaluate different ways to use Twitter in class assignments, vary the participation and role of instructors in discussion with their students, and measure the value of students' interaction with others outside of their classes on their class performance.

It is possible that students who volunteered to participate in the study were disproportionately interested or active in social media. However, the extra credit offered should have been a significant but not undue incentive for all students to participate.

CONCLUSIONS

Although Twitter increased students' social comfort of expression, it created no difference in students' perceptions of the value of group activity toward learning. In addition, Twitter use did not lead to better performance on test questions, but participants who used Twitter saw more usefulness in the tool for classroom purposes than did participants who didn't use Twitter. This study investigating the importance of Twitter in college education offered insight on student perceptions of Twitter in the classroom and objectively measured the tool's use on one type of learning outcome. New social media tools arise all the time, and educators continue to adjust to their use and application in mass communication. This study offers some limited findings about the way one social media site could build community among

classes of students and potentially create more active, engaged learners.

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