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Student use of Facebook for organizing collaborative classroom activities

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Abstract Social network sites such as Facebook are often conceived of as purely social spaces; however, as these sites have evolved, so have the ways in which students are using them. In this study, we examine how undergraduate students use the social network site Facebook to engage in classroom-related collaborative activities (e.g., arranging study groups, learning about course processes) to show how Facebook may be used as an informal tool that students use to organize their classroom experiences, and explore the factors that predict type of use. Data from two surveys (N=302, N=214) are used to analyze how Facebook use, social and psychological factors, self-efficacy, and types of instructor-student communication on Facebook are related to positive and negative collaboration among students. We found that predictors of Facebook use for class organizing behaviors include self-efficacy and perceived motivation to communicate with others using the site. When placed in the context of social and psychological factors, Facebook intensity did not predict either positive or negative collaboration, suggesting that how students used the site, rather than how often they used the tool or how important they felt it was, affected their propensity to collaborate.

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Information and communication technologies (ICTs) are becoming a ubiquitous component of classroom learning. ICTs ranging from traditional course management systems to more interactive tools, such as student response systems and classroom backchannels, now provide additional opportunities to support the learning process, and learning experts are examining the potential of new media tools to transform educational practices (Greenhow and Robelia 2009a). Often, these ICTs are formally designed for education, but in some cases students are repurposing tools initially designed for non-educational purposes. Besides their role in supporting pedagogy, ICTs may also support the "process" of being in a course for students, including issues like organizing study groups, or finding out more about the other people in the class.

A classroom can be thought of as a type of organization, which requires members to discover and apply knowledge about ambiguous factors such as implicit instructor goals, the abilities of other members, and course expectations. College courses have particular characteristics (e.g., temporality, potentially unclear objectives, shifting membership) that make organizing activities such as collaboration difficult, opening opportunities for ICTs to play a role. Formal technical systems that support courses may include tools like syllabi, course management systems (e.g., Moodle, Blackboard), or university-owned email distribution lists. Informal systems can include student-created communication channels such as websites, email lists, or online discussion forums where students gather for other purposes, like social interaction.

Facebook is another informal system equipped with tools designed for social interaction that students are re-appropriating for academic uses. The present research explores how undergraduate students are using Facebook as an informal communication platform through which they conduct various organizing activities such as sharing information about their classroom activities and collaborating with peers on assignments. Results are presented from two studies that explore how students are using Facebook to collaborate on academic-related tasks. The first study provides descriptive data about students who engage in classroom-related collaboration, while the second study expands on these findings by establishing a typology of classroom-related collaboration and examining the social and psychological factors that are associated with the likelihood to collaborate via Facebook.

Communication tools and organizing

Research in multiple fields, including computer-supported cooperative work, information systems, and computer-mediated communication, has examined how information technology facilitates interactions within organizations (Ackerman 2002; Grudin 1988, 1994; Orlikowski and Baroudi 1991; Orlikowski 1992). Communication technologies are often seen as reducing coordination costs required by the tasks of organizing (Thompson 1967). These systems are often described as important for reducing the uncertainty inherent in the process of organizing (Weick and Sutcliffe 2001) by accumulating the data necessary for making decisions. For instance, Sproull and Kiesler (1991) focused on how specific technologies like email and Usenet both helped and hindered organizational processes when multiple information and communication tools were used to transmit different types of information, regardless of the content of that information. Olson and Olson (2000) highlighted the importance of considering the intersection of task dependency (loosely coupled vs. tightly coupled) and available

channels to create the common ground needed to effectively accomplish collaboration within the organization.

However, communication technologies that are not formally endorsed by the organization can be repurposed to accomplish tasks of organizing. This creative repurposing of technology can be explained through different theoretical standpoints: Hutchins (1991) described distributed cognition as the use of information technology to expand a person's ability to remember and process data, similar to how a hammer extends a person's ability to apply force or how the features of a cockpit bring awareness to a pilot. Weick (1995) argued that one possible effect of information and communication technology was the creation of a "group mind" where users of a system engaged in a *collaborative sensemaking process*, using the technology to take advantage of each other's knowledge and to search for additional information. Sensemaking is the process by which organizational members interpret events that occur within the organization. These events can be emergent or part of the usual processes of organizing.

College classrooms have characteristics that can make organizing difficult for students. Being temporally bound means that there is a lot of dynamism in membership and expectations over time. The relative autonomy of professors, and the heterogeneous intellectual background among peers, can create unclear expectations for students trying to interpret how to excel in a class. In much the same way that Hutchins (1991) reported an airplane pilot using ICTs to engage in distributed cognition, it may be that students are using the ecology of ICTs around themselves to organize their classroom experience.

Using social network sites for informal organizing

Social network sites (SNSs) such as Facebook may facilitate informal communication around classroom activities. Facebook is not a formal system implemented by the university, but rather a commercial, publicly available system that students usually join for social reasons (Joinson 2008). In considering how Facebook may be employed by students to support organizing within a course, there are a number of software features that may lower the coordination costs associated with communicating with other students to reduce equivocality about classroom-related content. Facebook simplifies the process of managing a large network of connections. Users are presented with multiple communication channels, including private messages, public "Wall" postings, status updates, instant messaging, groups, and applications. Furthermore, Facebook may facilitate collaborative sensemaking among students because the majority of U.S. undergraduates students use these sites (Ellison et al. 2007; Lampe et al. 2008); more than half have incorporated SNSs into their college experience by using them for purposes such as communicating with their classmates about school (Salaway et al. 2008) and more than one-quarter have used a SNS in a course (Smith et al. 2009). Other research has found that students employ SNSs as a way to both formally and informally discuss academics (Greenhow and Robelia 2009a, 2009b; Madge et al. 2009; Selwyn 2009). Drawing from these studies, it may be that SNSs best serve educational goals by connecting students through these more informal methods rather than being used specifically for task completion because they allow students to learn through the process of collaborative sensemaking.

The research cited above indicates that some students use Facebook to support their educational goals, but little is known about how those tools are used for organizing the course experience, or the characteristics of students who are likely to re-use Facebook for organizing purposes. To fill in this gap in the literature, we conducted two studies to examine a number of variables related to organizing classroom-related activities through the

use of the popular SNS Facebook. The studies, detailed below, focus on students' propensity to collaborate (Study 1) and the different types of collaboration occurring on Facebook (Study 2).

Study 1: Propensity to use Facebook for collaboration (PFC)

In this study, we developed a statistical model explaining the propensity of students to use Facebook for classroom organizing by examining social, psychological, and demographic variables that may be important when predicting these uses. The model presented below includes a multi-dimensional measure of Facebook use developed by Ellison et al. (2007). We expect that those who use Facebook more intensely will be more likely to engage in non-traditional uses of the site like course organizing, because those users may have higher levels of self-efficacy regarding the tool and thus may be more likely to experiment with applying the tool to a larger set of contexts.

H1. Intensity of Facebook use will be positively associated with the propensity to use Facebook for classroom collaboration.

Subjective well-being has been shown to be an important predictor of student perceptions of social capital in past studies of Facebook use (Ellison et al. 2007; Ellison et al. in press; Steinfield et al. 2008). People with higher self-esteem may be more likely to approach classmates they may not know well, or to form groups with others, when seeking information about the class. Ellison et al. (2007) note an interaction effect such that those with lower self-esteem seemed to reap more social capital benefits from their use of the site. Similarly, students who are more satisfied with their life at the university may be more likely to use Facebook for organizing their academic collaborations because they see others in the larger organization as being helpful. Thus we propose:

H2: Self-esteem will be positively associated with the propensity to use Facebook for classroom collaboration.
H3: Satisfaction with life at the university will be positively associated with the propensity to use Facebook for classroom collaboration.

Instructors play an important role in classroom organizing processes. They might disambiguate course goals, help organize students, or create new ambiguities by changing assignments or expectations throughout the course of a semester. In our model, we include instructor-based Facebook behaviors, such as having a Facebook presence, as well as students' perceptions of the appropriateness of instructors' presence on the site. Research examining student-instructor relationships suggests that professors who have online profiles with high disclosure levels are associated with increased student motivation (Mazer et al. 2007) and that self-disclosures decreased uncertainty, increased student motivation, and created more positive attitudes toward both the course and the professor (O'Sullivan et al. 2004). In Facebook, "Friending" another user provides access to more information about that person; thus, we consider a set of behaviors that speak to students' desire to use the site to find out more about an instructor or to gather information from the instructor through the site (as opposed to traditional tools such as email or in-person visits during office hours):

H4. Willingness to (a) use Facebook to view the profile of an instructor, (b) contact an instructor through Facebook, and (c) "Friend" an instructor will be positively associated with the propensity to use Facebook for course organizing.

Finally, a premise of this research is that using the site for organizing purposes is likely to be associated with positive traits such as higher levels of self-efficacy, Internet literacy, and peer-to-peer learning; however, students may also be using the site to organize behaviors that instructors would not like, such as cheating (which we frame as "unapproved collaboration" because it can involve information-sharing and other behaviors associated with collaboration). Given the absence of any research about using SNSs for cheating, we pose a research question.

RQ1: What is the relationship between using the site for unapproved collaboration and the propensity to use Facebook for course organizing?

Study 1 method

We obtained a random sample of 1996 students from the registrar's office of a large, Midwestern university. Selected students were sent an email inviting them to participate in an online survey hosted on Zoomerang on their use of technology and specifically SNSs; those who completed the survey could provide their email address for a chance to win one of ten $50 gift certificates. The survey period lasted for approximately 2 weeks in March and April of 2009 and generated 373 responses for a response rate of 19%; of these respondents, 360 (97%) reported using Facebook. On average, participants were female (66%), Caucasian (88%), upperclassmen (58%), and 20.5 years old (*S.D.*=2.4).

Measures

In addition to collecting demographic information, the instrument included variables that have been important in previous studies of Facebook usage: Facebook intensity (FBI), satisfaction of life, and self-esteem (see, for example, Ellison et al. 2007). We also collected measures of classroom-specific Facebook behaviors and created an original scale to measure the use of Facebook for classroom collaboration.

Propensity to use Facebook for collaboration (PFC)

Collaboration using Facebook can involve both online-only (e.g., using Facebook as a medium for sharing notes) and online-to-offline (e.g., using the site to arrange a study group) interactions. Both types of collaboration were captured in a four-item scale (Cronbach's α=0.86), with one item measuring online-to-offline collaboration and three items measuring collaboration that may occur either online-only or online-to-offline (see Table 1).

Unapproved use of Facebook

To capture how students may be using Facebook for unapproved collaborative purposes, we included the item, "How likely are you to use Facebook to collaborate on an assignment in a way that your instructor might not like?" (*M*=2.45, *S.D.*=0.990). Note that the wording of this item ("might not like") could include behaviors that all instructors would find problematic (such as cheating) as well as those of which some instructors might approve but others would not (such as sharing definitions on a study guide). While the ambiguity of

Table 1 Propensity to use Facebook for collaboration scale (PFC)

	Mean	S.D.
Propensity to use Facebook for collaboration (α=0.86)	3.66	0.907
Arrange a study group or meeting	3.53	1.096
Collaborate on an assignment in a way that your instructor would like	3.33	1.139
Contact another student with a question related to class or schoolwork	4.01	0.999
Discuss classes or schoolwork	3.78	1.087

All items shared a common prompt: "How likely are you to use Facebook for the following things?" and were measured with a 5-point Likert-type scale ranging from 1="Very Unlikely" to 5="Very Likely."

the wording prevents us from making definitive claims about what the item measures, a more explicitly worded item regarding cheating behavior may not have captured the range of possible "unapproved" actions students can perform and also might suffer from social desirability effects. This item is distinct from PFC, as an exploratory factor analysis indicated that this item does not fit with the rest of the scale; furthermore, including the item lowers the reliability to 0.82.

Facebook usage

Facebook usage was measured through the Facebook Intensity scale (FBI; Ellison et al. 2007), which includes number of friends on the site, time spent on the site, and six Likert-type questions about respondents' emotional engagement with Facebook and integration of the site into their daily lives. This scale (α=0.86) has been used in other Facebook research (e.g., Tomai et al. 2010; Valenzuela et al. 2009).

Psychological well-being

Two separate measures comprised students' psychological well-being. Self-esteem was measured by seven items from the Rosenberg Self-Esteem Scale (Rosenberg 1989). Satisfaction with life at university was adapted from the Satisfaction with Life Scale (Diener et al. 1997; Pavot and Diener 1993) which has been used in previous research of college undergraduates (Ellison et al. 2007). Both measures reported responses on a five-point, Likert-type scale.

Instructor-student Facebook behaviors

Three original items were included to measure the extent to which participants use the site to interact with instructors. These items, which are all reported on a five-point, Likert-type scale ("Very Unlikely" to "Very Likely") were presented as follows: "Imagine an instructor in one of your current classes who you know uses Facebook. How likely are you to do the following? (1) Browse their profile on Facebook; (2) Contact them using Facebook, or by using information from Facebook; (3) Add them as a Facebook friend."

Study 1 results

To better understand the propensity to use Facebook for collaboration, we conducted an OLS regression with the PFC scale as the dependent variable. As shown in Table 2, the overall model

Table 2 Regression model of propensity to use Facebook for collaboration (N=302)

	Coefficient	t	p	
(Intercept)	1.074	2.45	0.015	*
Gender (Male)	−0.216	−2.14	0.033	*
Years of undergrad	−0.020	−0.40	0.688	
Age (in years)	−0.050	−2.11	0.060	
Hours of internet use	−0.060	−1.28	0.203	
GPA	−0.011	−0.24	0.813	
Facebook intensity	0.285	5.35	0.000	***
Self-esteem	0.069	1.31	0.192	
Satisfaction with life at university	0.031	0.59	0.556	
Unapproved use of Facebook	0.266	5.49	0.000	***
View profile of instructor	0.207	4.05	0.000	***
Contact instructor via Facebook	0.147	2.13	0.034	*
Add instructor as friend on Facebook	−0.074	−1.04	0.301	
R^2	0.373	Adjusted R^2:	0.348	

*p<0.05, ***p<0.001

was significant (F (12, 301)=14.92, p<0.001), explaining 35% of the variance in PFC and identifying a number of factors that are associated with propensity to use Facebook for collaboration, while controlling for demographic and other variables. All variables except for gender, year in school, age, and hours of Internet use have been standardized.

H1 stated that Facebook intensity would positively predict PFC; results support this hypothesis (β=0.285, p<0.001). Neither H2, regarding self-esteem (M=3.92, $S.D.$=0.398, α=0.88), nor H3, regarding satisfaction with university life (M=3.58, $S.D.$=0.756, α=0.84), were supported. H4a, browsing an instructor's profile (M=3.29, $S.D.$=1.293), and H4b, contacting the instructor using information from Facebook (M=2.02, $S.D.$=1.079) were both supported, such that respondents who are likely to view an instructor's Facebook profile (β=0.207, p<0.001) or to contact the instructor via Facebook (β=0.147, p<0.05) were more likely to be using the site for collaboration; however, adding an instructor as a friend (M=2.12, $S.D.$ = 1.148) was not significant, so H4c was not supported.

The research question asked whether a relationship existed between students' "unapproved" uses of Facebook and their propensity to use the site for collaboration. Unapproved Use of Facebook positively predicted PFC (β=0.266, p<0.001); however, this practice does not seem widespread, as only 18% reported that they were "Likely" or "Very Likely" to engage in this behavior. This subset of respondents was also significantly more likely to view the profile of a professor (M=3.37 vs. M=3.00, pooled $S.D.$=1.2, p<0.05) and to contact the instructor via Facebook (M=2.40 vs. M=1.93, pooled $S.D.$=1.07, p<0.05).

Study 1 discussion

Our regression model explored a number of factors that might affect one's propensity to use Facebook for collaboration in the classroom context, which we operationalized as a set of activities including collaborating, discussing, or asking questions about schoolwork, and arranging a study group. Based on previous literature, we envisioned these collaboration practices as methods for reducing the equivocality inherent in the classroom process.

Facebook intensity was a significant predictor of students' propensity to use Facebook for collaboration. One reason for this could be that students who spend more time on Facebook and have more friends and intensity simply have more opportunities to use it for collaboration than those who spend less time and have smaller networks. Another reason could be that those students who use the site more often have a more developed skill set and thus are familiar with using the site for purposes beyond those that are strictly social. In this case, FBI may act as a rough proxy for efficacy in the use of Facebook, enabling them to repurpose the site for purposes like reducing classroom equivocality. We readdress the construct of efficacy in Study 2.

We had hypothesized that users with high self-esteem (H2) and high satisfaction with life at the university (H3) would be more likely to use Facebook to engage in classroom collaboration; however, neither hypothesis was supported. It may be that these variables have varying relationships with different types of collaboration, and the all-in-one collaboration measure we used muddles these effects. To address this issue, we revisit these hypotheses in Study 2.

An interesting finding of this work is initial evidence concerning the role of instructors on Facebook. Respondents who were more likely to view their instructors' Facebook profiles were more likely to report engaging in collaboration using Facebook. In the classroom, both students and instructors are engaged in a collaborative organizational process, but have different goals that are at least partially defined by their roles. Students may be looking for information from Facebook to collect cues about their instructors in order to disambiguate the characteristics of those instructors, including pedagogical styles, learning outcomes, or grading trends. Another explanation could be that an intervening variable not measured here, such as high motivation to succeed in the class, is affecting both PFC and likelihood to seek information about an instructor using Facebook.

Viewing the profile of an instructor and contacting the instructor through Facebook positively predicted participants' propensity to use Facebook for collaboration, but friending an instructor was not statistically significant. This latter finding may reflect students' desire to protect their personal lives from authority figures, especially in light of media reports detailing the negative consequences resulting from universities and employers gaining access to students' profiles (e.g., Lang 2009). Furthermore, viewing a profile or sending a message through Facebook represents an isolated, one-time activity, whereas friending implies a long-term relationship; thus, even students who repurpose the site for academic activities may be reluctant to make a Friending commitment to their instructors.

Our research question examined the likelihood that students would use Facebook to "collaborate on an assignment in a way an instructor might not like." This question reflects an alternative framework in which the goals of the students and the goals of the instructor may not be aligned in terms of the extent and nature of the collaborative activity. We found that this type of interaction was positively related to PFC, meaning that the more likely one was to collaborate on an assignment in a way that instructor would not approve of using Facebook, the more likely one was to engage in the other activities included in the PFC scale. However, the one-item measure of unapproved use is susceptible to reliability and validity issues, which we address through Study 2.

Study 2: Social and psychological predictors of collaboration

The results from our first study suggest that the more students use Facebook, the more likely they are to engage in collaboration activities via Facebook. We also found that

students who are likely to organize through Facebook are also more likely to contact their instructors and view instructor profiles through Facebook. There was also a strong positive relationship between "inappropriate" use of Facebook and collaboration, but an exploratory factor analysis suggests they are two different factors.

In Study 2, we address limitations related to the Propensity to use Facebook for Collaboration (PFC) scale and explore the extent to which there are different dimensions to this activity. The results from Study 1 suggested that inappropriate use of Facebook, while not the same as the PFC that we measured, may represent a different type of collaboration. It could be that the processes of collaboration are the same, but the end-goals are different. To untangle these nuances, we included additional items that illustrate different types of uses—both appropriate and inappropriate—in order to more clearly identify different types of collaboration:

RQ1: What types of Facebook-enabled classroom collaboration exist?

Intrinsic factors that contribute to collaboration

In Study 1, psychological well-being factors (self-esteem and satisfaction with university life) were not significant predictors of Facebook-enabled collaboration; however, we include self-esteem and satisfaction with life in our second model under the assumption that they may be predictors of certain types of collaboration but not others. Previous work on SNS use by college students has shown that these variables were positive predictors of social capital (Ellison et al. 2007).

RQ2: Does the relationship between psychological well-being and use of Facebook for course organizing vary based on the type of collaboration?

In Study 1, we were unsure about the mechanism by which Facebook intensity (FBI) was associated with PFC—was FBI functioning as an indicator of more time spent on Facebook or as a rough proxy of efficacy? Therefore, in Study 2, we introduced Facebook self-efficacy as a more direct measure of the individual's belief in his or her ability to use the features of Facebook to accomplish tasks like setting privacy controls, and kept FBI as a control. Self-efficacy is the belief that an individual has about their own capability to do a certain task regardless of their actual technological ability (Bandura 1977). Since Facebook is a collection of different features, the individual's comfort level regarding certain types of Facebook use may determine which types of collaboration they engage in:

RQ3: What types of Facebook self-efficacy affect the propensity to use Facebook for classroom collaboration?

Study 1 found that instructors' presence on Facebook affected students' propensity to collaborate; however, the term "instructor" could refer to a professor or a teaching assistant (TA). Without any evidence that students may perceive professors and TAs differently, we decided to create independent items asking about students' behavior toward professors and TAs. Since we knew from Study 1 that students were engaging in both passive and active forms of communication, we created a more specific measure of using Facebook for active communication: asking for help. We posited that willingness to ask the instructor for help through Facebook (a more refined measure compared to Study 1's "contact an instructor through Facebook") would be positively associated with the propensity to use Facebook for collaboration:

H1: Willingness to ask a professor for help through Facebook will be positively associated with the propensity to use Facebook for classroom collaboration.
H2: Willingness to ask a TA for help through Facebook will be positively associated with the propensity to use Facebook for classroom collaboration.

Perceived site use contributes to propensity to use Facebook in course organizing

The above hypotheses and research questions address psychological characteristics that would contribute to an individual's likelihood of engaging in Facebook-related classroom collaboration. More recent research on SNS behavior suggests that different communication-based uses of the site will be associated with different outcomes. For instance, Ellison et al. (in press) find that using the site to engage in social information-seeking, or finding out about proximate others and latent ties, was predictive of bridging and bonding social capital whereas initiating, or using Facebook to try to connect with strangers, was not. Similarly, research within the organizational setting suggests that SNS features may help support the social dimensions of collaboration; DiMicco et al. (2009) found that employees reported using an internal SNS to get to know their coworkers through a process they termed people sensemaking. We wished to explore whether different ways of using the site, specifically regarding Facebook-related relational communication activities, were related to students' propensity to use the site for classroom collaboration. We focused on the two strategies (initiating and social information-seeking) that involved strangers and latent ties but did not study use of the third strategy, maintaining, which speaks to use of Facebook among close friends. Given the lack of literature on this specific point, we ask the following research question:

RQ4: What is the relationship between Facebook-related relational communication activities and the propensity to use Facebook for classroom collaboration?

Study 2 method

Data from a convenience sample of 265 students was collected from three classes in the telecommunication department at a large Midwestern university. Students were invited to participate in an online survey hosted on SurveyGizmo about their use of social network sites. The survey period lasted for 16 days in November and December of 2009. Participants were primarily male (65%) with an average age of 20 (M=20.49, $S.D.$=2.26) Ninety percent of participants were in-state students, and 5% were international students.

Measures

Propensity to use Facebook for collaboration To address RQ1, we expanded our measure of the types of collaboration activities students were engaging in through Facebook beyond the four items included in PFC. The survey instrument asked students to rate the likelihood that they would use Facebook for a wide range of tasks, including 12 new items in addition to the four original items that make up PFC.

We then conducted an exploratory factor analysis. Using a principal components analysis with a Varimax rotation, two distinct factors emerged, which we labeled "positive collaboration" and "negative collaboration." The positive collaboration scale (α=0.91) contains nine items, including arranging a group project, discussing classes or schoolwork, and asking a

classmate for help in a class. The negative collaboration scale (α=0.85) contains three items, including the negative item from Study 1, "collaborate on an assignment in a way the instructor would not like." The full set of items and factor loadings are shown in Table 3.

Facebook self-efficacy To measure self-efficacy, we created an original scale. The instrument asked participants to assess the extent to which they felt confident using specific Facebook features and engaging in specific Facebook activities. Responses were reported using a five-point Likert-type scale ranging from "Strongly Disagree" to "Strongly Agree." A principal components analysis using Varimax rotation showed four factor loadings with eigenvalues above 1, explaining 64% of total variance; however, only three factors—those with alphas above 0.70—were included in the analysis. *Facebook communication self-efficacy* (M=3.83, $S.D.$=0.810, α=0.81) was a four-item scale about using different communication tools on Facebook to convey messages ("I feel confident using the private message feature on Facebook," "I feel confident posting public messages on one of my Facebook Friend's walls," "I feel confident using the comments feature to respond to status updates and wall posts," and "I feel confident using Facebook Chat to send and receive instant messages (IMs) with my Facebook Friends."). *Facebook interest self-efficacy* (M=3.18, $S.D.$=1.017, α=0.83) contained three items about confidence in finding information about one's interest ("I feel confident searching for Facebook Groups related to my interests," "I feel confident posting comments to a Facebook Group," and "I feel confident searching for Facebook applications related to my interests."). *Facebook privacy self-efficacy* (M=4.07, $S.D.$=0.629, α=0.73) was a three-item scale assessing one's confidence in making changes to privacy settings ("I feel confident changing my settings to prevent a Facebook friend from viewing parts of my profile," "I feel confident adjusting the privacy settings on my Facebook account," and "I feel confident untagging myself from photos if I want to.").

Psychological and demographic measures In addition to psychological and demographic measures used in Study 1, we asked about what grade the student expected to receive for the

Table 3 Collaboration processes based on factor analysis

	Factor loadings
Positive collaboration (M=2.56, $S.D.$=.776, α=.91)	
To arrange a meeting for a group project.	.824
To ask a classmate for help in the class.	.795
To use Facebook to help manage a group project.	.793
To contact another student with a question related to a class or schoolwork.	.761
To discuss classes or schoolwork.	.757
To collaborate on an assignment in a way your instructor would like.	.738
To arrange a face-to-face study group.	.720
To do something on Facebook as part of an assigned class exercise.	.657
To discuss the results of a quiz or test with a classmate after you have both taken it.	.655
Negative collaboration (M=3.58, $S.D.$=.961, α=.85)	
To share homework answers in a way your instructor would not approve of.	.893
To collaborate on an assignment in a way your instructor would not like.	.843
To share answers from a quiz or test with someone who has yet to take it.	.834

All statements were preceded by, "I use Facebook..."

specific class in which they were taking the survey. We anticipated that the course grade may be a better predictor than overall grade point average in that questions were tied to a specific class. This variable was not significantly related to the dependent variable, however, and was removed from the regression model to prevent over-fitting. In addition, time spent on the Internet was removed because the variable was not useful in the regression model presented in Study 1.

Connection strategies Initiating new relationships and social information-seeking measures were drawn from Ellison et al. (in press) Initiating new relationships (M=2.61, $S.D.$=0.652, α=0.82) was a five-item scale that asked participants to imagine an unknown student on campus and rate how likely they were to browse the student's profile, contact, add the student as a Facebook friend, or meet the student in person. The final item in this scale asked participants to rate their agreement with the statement, "I use Facebook to meet new people." Social information-seeking (M=2.75, $S.D.$=0.536, α=0.80) contained four items related to students' use of Facebook to gather information about other users, including people met socially, in the same class, and living nearby, as well as viewing profiles of other students in the same class.

Study 2 results

We created two OLS regression models, using propensity of positive and negative collaboration as dependent variables and social, psychological, and demographic factors as the independent variables.

Explaining propensity to use Facebook for positive collaboration

The first model testing positive collaboration (see Table 4) was statistically significant (F(13, 213)=17.632, p<0.001), with an adjusted R^2 of 0.51. Missing data were not replaced with means.

Table 4 Regression model of propensity to use Facebook for positive collaboration (N=214)

	Coefficient	t	p	
(Intercept)		3.375	0.001	
Gender (Male)	0.107	2.005	0.047	*
Years of undergrad	0.097	1.441	0.152	
Age (in years)	−0.096	−1.446	0.150	
Facebook intensity	0.087	1.375	0.171	
Self-esteem	−0.084	−1.211	0.228	
Satisfaction with life at university	0.066	1.016	0.311	
Facebook communication self-efficacy	0.136	1.855	0.065	
Facebook privacy self-efficacy	0.262	4.442	0.000	***
Facebook interest self-efficacy	0.000	0.004	0.997	
Initiating	0.155	2.823	0.005	**
Social information-seeking	−0.424	−6.683	0.000	***
Ask professor for help	0.103	1.266	0.207	
Ask TA for help	0.157	1.981	0.049	*
R^2	0.547	Adjusted R^2:	0.511	

*p<0.05, **p<0.01, ***p<0.001

Asking a professor for help through Facebook (M=2.31, $S.D.$=1.035) had no significant impact on positive collaboration; therefore, H1 was not supported. However, students who tried to ask the TA for help (M=2.46, $S.D.$=1.067) were more likely to collaborate positively (β=0.157, p<0.05), supporting H2.

Addressing the research questions, neither self-esteem nor satisfaction with university life were related to propensity to engage in positive collaboration (RQ2); however, students with higher self-efficacy in Facebook privacy settings (β=0.262, p<0.001) were more likely to engage in positive collaboration (RQ3). Facebook interest and Facebook communication self-efficacy were non-significant. Students more likely to initiate new relationships (β=0.155, p<0.01) were more likely to engage in positive collaboration (RQ4). Students more likely to engage in social information-seeking (β=−0.424, p<0.001) were less likely to organize positively (RQ4). Of the demographic variables, only gender was significant: males were more likely than females to collaborate positively through Facebook.

Explaining propensity of negative collaboration

Our regression model (Table 5) explaining negative collaboration (F (13, 178)=10.702, p<0.001) was statistically significant and had an adjusted R^2 of 0.42. Missing data were not replaced with means.

Asking a professor for help through Facebook had no significant impact on negative collaboration; therefore, H1 was not supported. However, students who tried to contact the TA were more likely to collaborate negatively (β=0.359, p<0.001), supporting H2.

We found that the psychological well-being variables of self-esteem and satisfaction with university life (RQ2) played a significant role in explaining the propensity to collaborate negatively. Students who had high self-esteem (β=−0.287, p<0.001) were less likely to collaborate negatively, whereas students with high satisfaction with university life were more likely to collaborate negatively (β=0.203, p<0.05).

Table 5 Regression model of propensity to use Facebook for negative collaboration (N=179)

	Coefficient	t	p	
(Intercept)		1.567	0.119	
Gender (Male)	−0.008	−0.140	0.889	
Years of undergrad	0.247	3.383	0.001	**
Age (in years)	−0.045	−0.618	0.537	
Facebook intensity	0.138	2.009	0.046	*
Self-esteem	−0.287	−3.818	0.000	***
Satisfaction with life at university	0.203	2.883	0.004	**
Facebook communication self-efficacy	−0.013	−0.161	0.872	
Facebook privacy self-efficacy	0.094	1.452	0.148	
Facebook interest self-efficacy	−0.170	−2.353	0.020	*
Initiating	0.174	2.906	0.004	**
Social information-seeking	−0.186	−2.710	0.007	**
Ask professor for help	0.085	0.965	0.336	
Ask TA for help	0.359	4.184	0.000	***
R^2	0.457	Adjusted R^2:	0.415	

*p<0.05, **p<0.01, ***p<0.001

Students who had higher Facebook interest self-efficacy (RQ3) were less likely to collaborate negatively (β=−0.170, p<0.05). Facebook privacy and Facebook communication self-efficacy, however, were non-significant.

Initiating relationships on Facebook (β=0.174, p<0.01) was a positive predictor of likelihood to collaborate negatively (RQ4). On the other hand, students who were more likely to engage in social information-seeking (β=−0.186, p<0.05) were less likely to collaborate negatively (RQ4).

Of demographic variables, only the year of college was significant. Students who were more senior in their college career were more likely to collaborate negatively than those in their early years of college (β=0.247, p<0.01).

Study 2 discussion

Our findings suggest that there are two variants of collaboration, which we label positive and negative. This finding addresses our first research question about types of collaboration. Study 2 results indicate that the four items for collaboration we had used for Study 1 only explained positive collaboration (see Table 3). Given that there seem to be differences in what predicts whether students engage in either positive or negative collaboration (see Tables 4 and 5), one interpretation is that students have different beliefs about the normative use of Facebook. Four items, including "getting notes when you've missed a class" and "finding out what material will be on a quiz or test" cross-loaded onto both positive and negative collaboration factors and were removed. Since factor analysis shows patterns of answers, this suggests that cross-loaded items were those that were being interpreted differently among students. For instance, "finding out what material will be on a quiz or test" could be perceived as negative collaboration (cheating) if it happens before the exam, but could also be interpreted as sharing an instructor-provided study guide (more likely to be seen as positive collaboration) which was why this item was not included in either positive or negative scales.

We found that psychological well-being variables correlate only with self-reported negative collaboration activities (RQ2). Students with low self-esteem were more likely to collaborate negatively, consistent with previous research showing that students with low self-esteem are more likely to cheat (McCabe 2007). Surprisingly, students with higher satisfaction with university life were more likely to collaborate negatively. This finding bears further investigation, as we do not have an empirically grounded interpretation of this relationship. One possibility could be that students view university life in a way that we were unable to capture in this study (e.g., as a social rather than academic experience).

Study 2 showed that Facebook self-efficacy is related to one's propensity to collaborate through Facebook. However, a granular investigation of different types of self-efficacy reveals that not all forms of self-efficacy are positively associated with the likelihood to collaborate. For positive collaboration, we found that *Facebook privacy self-efficacy*, which assesses participants' perceived ability to use Facebook's tools to control their privacy, was a significant positive predictor.

For negative collaboration, however, we found that *Facebook privacy self-efficacy* was not a significant predictor. Rather, a lack of *Facebook interest self-efficacy*, the perceived ability to use Facebook to find topics of interest, was associated with the likelihood to collaborate negatively. We had expected that *Facebook privacy self-efficacy* would be related to negative collaboration, as the ability to control privacy options may allow the user to engage in behaviors that might be sanctioned with less fear of reprisal. Given the lack of a relationship between these variables, it could be that an intervening variable is affecting this relationship. This relationship requires further study.

Our two hypotheses about seeking help from instructors through Facebook revealed surprising results. Students who were more likely to ask their TA for help using Facebook were more likely to collaborate both *positively and negatively*. These results suggest that students who collaborate through Facebook are more likely to engage in multiple types of uses of the tool to seek information about their class and achieve their goals, regardless of whether they intend to use positive or negative collaboration to do so. In particular, asking the TA for help through Facebook had a high coefficient (.359) in the model explaining negative collaboration and was significant at the $p<.001$ level. Students may engage in multiple, parallel information-seeking activities to advance their goals within the classroom, both in positive and negative collaborations. Consequently, using Facebook, as well as formal channels, to interact with instructors represents a "spread spectrum" strategy in which the student is accessing multiple communication channels to ensure success.

The perceived propensity to ask professors questions using Facebook was not significantly related to either positive or negative collaboration. It could be that the smaller age difference between teaching assistants and undergraduate students (compared to faculty and students) may affect the perceived appropriateness of using Facebook as a communication channel, since TAs are typically graduate students who may only be a few years older than the respondents. For communication with their professors, students may prefer more formal methods of communication such as e-mail or in-person conversations during office hours, which would be reified by formal communication policies set forth in syllabi. On the other hand, students may also assume their professors do not have Facebook accounts or rarely log onto the site. It could also be that students see norms of interacting in a space where social self-presentational content may be intermingled with professional self-presentational content to be more of a risk with professors rather than with TAs. Alternatively, the inability to resolve issues involving the professor in the first place may lead students to seek help from other people, such as classmates or TAs.

Finally, we examined two communication-based variables: initiating new relationships via Facebook and social information-seeking, which captured activities associated with using the site to find out information about proximate others. These variables significantly explained the propensity to use Facebook for both positive and negative collaboration. Initiating new relationships was a significant positive factor: since classroom collaboration takes place in a loosely coupled system where students often do not know each other prior to taking the same class, students who are more likely to use the site to initiate new relationships (which is not a normative use; see Ellison et al. in press) might be more likely to engage in activities associated with collaboration, such as creating a study group. Even though students may come to know each other over time within one class, or across multiple classes, in large universities they often enter classes as strangers to one another. The propensity to initiate relationships with strangers captured in the "initiating" scale may indicate a greater willingness to interact with unknown people to accomplish overall goals.

However, students who were more likely to use Facebook to engage in social information-seeking—learning information about people with whom they had some kind of offline connection—were less likely to collaborate in both positive and negative contexts. This could be because students who score highly in social information seeking through Facebook see the site as a social medium, and are less likely to map its use to work purposes. Items such as "I use Facebook to learn more about other people in my classes" could refer to either learning about others for work (collaboration) purposes or more social uses; future work should explore this finding in more depth.

Discussion

We conducted two studies: the first study examined whether or not students were engaging in collaboration, as well as the demographic variables and types of instructor-student communication that predict their likelihood to collaborate using Facebook. We developed a four-item scale labeled "propensity to use Facebook for collaboration" and conducted an OLS regression to ascertain the relationship between a number of demographic and academic variables and students' propensity to collaborate through Facebook. We found that students who were likely to use Facebook to interact with their instructor in various ways were more likely to collaborate using Facebook. We did not find any significant results regarding psychological well being, but found an interesting relationship between a one-item item—"collaborating in a way your instructor would not approve"—and the propensity to collaborate using Facebook.

Study 1 raised a number of new questions, especially regarding our measure of collaboration, which we explored further in Study 2. First, we refined the concept of collaboration: based on the strong relationship between unapproved use of Facebook in Study 1, we added several more items describing different types of collaborative activities and conducted a factor analysis, which confirmed two distinct factors of negative and positive collaboration. We re-examined the role of psychological well-being separately in the contexts of negative and positive collaboration and added some new constructs; Facebook self-efficacy was introduced to assess the skill level of the students, along with two variables describing social behaviors on the site (initiating new relationships and social information-seeking). We also included separate items about professors and teaching assistants (TAs).

This study provides several important findings. The first is that psychological well-being variables affect the propensity of negative collaboration, but not positive collaboration. Students with high self-esteem were less likely to collaborate negatively but students with high self-esteem were not necessarily more likely to collaborate positively. This supports research on self-esteem suggesting that high self-esteem does not necessarily predict good performance (Baumeister et al. 2003). Self-esteem is not necessarily a trait that professors consider in their pedagogy, but these findings could be of interest to health service groups within colleges, who often deal with the psychosocial health of students.

Second, communication practices on the site, such as using the site to learn more about others or to connect with strangers, are predictive of both types of collaboration. Likelihood of initiating new relationships on Facebook increased propensity to collaborate, while the likelihood of using Facebook to look up information about people from offline contexts decreased propensity to collaborate. Similar to other trends in SNS research, this points to a need to consider specific communication practices when studying use of the site (as opposed to global measures of time on site or other more generic assessments).

Third, certain types of Facebook self-efficacy have a significant effect on collaboration. Higher Facebook self-efficacy regarding privacy settings increases the likelihood to collaborate positively, suggesting that greater comfort with more granular knowledge of the tool contributes to positive uses. Higher Facebook self-efficacy regarding finding things related to one's interest, however, decreases likelihood of collaborating negatively, suggesting that confidence in more information-seeking skills could reduce the propensity of negative collaboration.

Fourth, Facebook Intensity (FBI) was a statistically significant and important variable in Study 1, but neither as significant nor as important in Study 2. As we controlled for more ways of using Facebook, we found that the estimates for FBI in Study 2 were lower because our other

variables were better at explaining how students were using Facebook to support their classroom collaborations. Facebook use is heterogeneous, and multiple types of uses could all independently lead to high Facebook Intensity. In other words, seeing Facebook as essential for social processes, or seeing it as key for collaboration, would both lead to reports of high Facebook Intensity, which captures users' beliefs about the site's importance to them.

We found in Study 1 that students who view the Facebook profiles of their instructors and attempt to contact them through the site are more likely to use Facebook to collaborate. Previous research has suggested that many students do not want their instructors to have a presence on the site (Hewitt and Forte 2006). Our findings support this to some extent since "friending an instructor" was not a significant factor in explaining propensity to collaborate. However, in Study 2, we found that although fewer students were using Facebook to connect with their instructors, the likelihood of asking an instructor for help on Facebook significantly explained the propensity to collaborate in the case of teaching assistants but not professors. In combination with other research showing that few students are using Facebook to interact with their instructors (Madge et al. 2009; Salaway et al. 2008), our findings suggest that professors who eschew Facebook may be missing an opportunity to engage with their students and encourage them to use alternative methods to reduce equivocality about their classes. It is also very likely that many students and professors perceive certain norms regarding how Facebook should be used, which reduces the likelihood of collaborating through Facebook. Future research should continue to monitor this relationship, as these norms may shift over time.

Limitations

As with any survey-based research, this study collected user impressions about how they behave online, and not actual behaviors. While some work (e.g., Burke et al. 2010) has shown that impressions of Facebook use are relatively close to actual use, these findings should be seen as addressing attitudes toward behavior, not actual behavior.

Additionally, both studies involved sampling biases that should be considered when generalizing results. Study 1 involved a random sample from a large, public university in the U.S. These students may be more used to large classes, and may be more likely to come from local secondary schools, than students in private or community colleges. Study 2 involved students in courses from a technology-oriented department, which may increase the propensity of those students to both use and re-use technology. We have no evidence that these biases affected results, but would argue for caution in generalizing these results more broadly.

Conclusion

Facebook is a tool that is widely used by college students as a social communication platform. Some of these users are repurposing Facebook as a tool for classroom organizing and supporting collaborations that are instructor-sanctioned—as well as those that are not. These findings complement a growing corpus of research that explores outcomes of SNS use. Popular media have suggested that students' use of SNSs is related to poorer academic performance (Hamilton 2009), although academic work has shown no relationship between SNS use and grades (Pasek et al. 2009). Academic research has also suggested that students see SNSs as predominantly social or entertainment systems (Joinson 2008). We found that

some students are using Facebook to collaborate around classroom activities, which may lead to new forms of classroom interactions that support the loosely coupled, time-bound nature of the class as an organization. Future work should assess whether these activities are likely to result in positive outcomes, such as increased interest in the course, gains in school-related self-efficacy, or higher levels of engagement with course content. While we do not expect Facebook to independently cause a paradigmatic shift in students' educational experiences, the repurposing of a tool that the vast majority of students are accessing on a daily basis has the potential to support new forms of interaction between students and instructors.

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