

Computer-Supported Collaborative Learning DOI 10.1007/s11412-011-9115-y

# Student use of Facebook for organizing collaborative classroom activities

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Received: 25 August 2010 / Accepted: 22 March 2011 © International Society of the Learning Sciences, Inc.; Springer Science + Business Media, LLC 2011

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Abstract Social network sites such as Facebook are often conceived of as purely social 11 spaces; however, as these sites have evolved, so have the ways in which students are using 12them. In this study, we examine how undergraduate students use the social network site 13 Facebook to engage in classroom-related collaborative activities (e.g., arranging study 14 groups, learning about course processes), show how Facebook may be used as an informal 15tool that students use to organize their classroom experiences, and explore the factors that 16predict type of use. Data from two surveys (N=305, N=226) are used to analyze how 17Facebook use, social and psychological factors, self-efficacy, and types of instructor-student 18communication on Facebook are related to positive and negative collaboration among 19students. We find that predictors of Facebook use for class organizing behaviors include 20self-efficacy and perceived motivation to communicate with others using the site. When 21placed in the context of social and psychological factors, Facebook Intensity did not predict 22either positive or negative collaboration, suggesting that how students used the site, rather 23than how often they use the tool or how important they felt it was, affected their propensity 24to collaborate. 25

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KeywordsBricolage · Classroom · Computer-supported collaborative learning · Facebook ·26Sensemaking · Social network sites27

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29Information and communication technologies (ICTs) are becoming a ubiquitous component of classroom learning. ICTs ranging from traditional course management systems to more interactive 30 tools, such as student response systems and classroom backchannels, now provide additional 31 opportunities to support the learning process, and learning experts are examining the potential of 32 new media tools to transform educational practices (Greenhow and Robelia 2009a). Often, these 33 34 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 35 may also support the "process" of being in a course for students, including issues like 36 37 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 38 discover and apply knowledge about ambiguous factors such as implicit instructor goals, 39the abilities of other members, and course expectations. College courses have particular 40characteristics (e.g., temporality, potentially unclear objectives, shifting membership) that 41 make organizing activities such as collaboration difficult, opening opportunities for ICTs to 42 play a role. Formal technical systems that support courses may include tools like syllabi, 43course management systems (e.g., Moodle, Blackboard), or university-owned email 44 distribution lists. Informal systems can include student-created communication channels 45such as websites, email lists, or online discussion forums where students gather for other 46 purposes, like social interaction. 47

Facebook is another informal system equipped with tools designed for social interaction 48 that students are re-appropriating for academic uses. The present research explores how 49undergraduate students are using Facebook as an informal communication platform through 50which they conduct various organizing activities such as sharing information about their 51classroom activities and collaborating with peers on assignments. Results are presented 52from two studies that explore how students are using Facebook to collaborate on academic-53related tasks. The first study provides descriptive data about students who engage in 54classroom-related collaboration, while the second study expands on these findings by 55establishing a typology of classroom-related collaboration and examining the social and 56psychological factors that are associated with the likelihood to collaborate via Facebook. 57

#### Communication tools and organizing

Research in multiple fields, including computer-supported cooperative work, information 59systems, and computer-mediated communication, has examined how information technology 60 facilitates interactions within organizations (Ackerman 2002; Grudin 1988, 1994; Orlikowski 61 and Baroudi 1991; Orlikowski 1992). Communication technologies are often seen as reducing 62 coordination costs required by the tasks of organizing (Thompson 1967). These systems are 63 often described as important for reducing the uncertainty inherent in the process of organizing 64(Weick and Sutcliffe 2001) by accumulating the data necessary for making decisions. For 65 instance, Sproull and Kiesler (1991) focused on how specific technologies like email and 66 Usenet both helped and hindered organizational processes when multiple information and 67 communication tools were used to transmit different types of information, regardless of the 68 content of that information. Olson and Olson (2000) highlighted the importance of considering 69 the intersection of task dependency (loosely coupled vs. tightly coupled) and available 70

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channels to create the common ground needed to effectively accomplish collaboration within 71 the organization. 72

However, communication technologies that are not formally endorsed by the 73organization can be repurposed to accomplish tasks of organizing. This creative 74 repurposing of technology can be explained through different theoretical standpoints: 75Hutchins (1991) described distributed cognition as the use of information technology to 76expand a person's ability to remember and process data, similar to how a hammer extends a 77 person's ability to apply force or how the features of a cockpit bring awareness to a pilot. 78Weick (1995) argued that one possible effect of information and communication technology 79was the creation of a "group mind" where users of a system engaged in a collaborative 80 sensemaking process, using the technology to take advantage of each other's knowledge 81 and to search for additional information. Sensemaking is the process by which 82 organizational members interpret events that occur within the organization. These events 83 can be emergent or part of the usual processes of organizing. 84

College classrooms have characteristics that can make organizing difficult for students. 85 Being temporally bound means that there is a lot of dynamism in membership and 86 expectations over time. The relative autonomy of professors, and the heterogeneous 87 intellectual background among peers, can create unclear expectations for students trying to 88 interpret how to excel in a class. In much the same way that Hutchins (1991) reported an 89 airplane pilot using ICTs to engage in distributed cognition, it may be that students are 90 using the ecology of ICTs around themselves to organize their classroom experience. 91

Using social network sites for informal organizing

Social network sites (SNSs) such as Facebook may facilitate informal communication 93 around classroom activities. Facebook is not a formal system implemented by the 94university, but rather a commercial, publicly available system that students usually join 95for social reasons (Joinson 2008). In considering how Facebook may be employed by 96 students to support organizing within a course, there are a number of software features that 97 may lower the coordination costs associated with communicating with other students to 98 reduce equivocality about classroom-related content. Facebook simplifies the process of 99 managing a large network of connections. Users are presented with multiple communica-100tion channels, including private messages, public "Wall" postings, status updates, instant 101 messaging, groups, and applications. Furthermore, Facebook may facilitate collaborative 102sensemaking among students because the majority of U.S. undergraduates students use 103these sites (Ellison et al. 2007; Lampe et al. 2008); more than half have incorporated SNSs 104into their college experience by using them for purposes such as communicating with their 105classmates about school (Salaway et al. 2008) and more than one-quarter have used a SNS 106in a course (Smith et al. 2009). Other research has found that students employ SNSs as a 107 way to both formally and informally discuss academics (Greenhow and Robelia 2009a, 1082009b; Madge et al. 2009; Selwyn 2009). Drawing from these studies, it may be that SNSs 109best serve educational goals by connecting students through these more informal methods 110 rather than being used specifically for task completion because they allow students to learn 111 through the process of collaborative sensemaking. 112

The research cited above indicates that some students use Facebook to support their 113 educational goals, but little is known about how those tools are used for organizing the 114 course experience, or the characteristics of students who are likely to re-use Facebook for 115 organizing purposes. To fill in this gap in the literature, we conducted two studies to 116 examine a number of variables related to organizing classroom-related activities through the 117

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use of the popular SNS Facebook. The studies, detailed below, focus on students' 118 propensity to collaborate (Study 1) and the different types of collaboration occurring on 119 Facebook (Study 2). 120

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

In this study, we developed a statistical model explaining the propensity of students to use 122 Facebook for classroom organizing by examining social, psychological, and demographic 123variables that may be important when predicting these uses. The model presented below 124includes a multi-dimensional measure of Facebook use developed by Ellison et al. (2007). 125We expect that those who use Facebook more intensely will be more likely to engage in 126non-traditional uses of the site like course organizing, because those users may have higher 127levels of self-efficacy regarding the tool and may thus be more likely to experiment with 128applying the tool to a larger set of contexts. 129

 H1. Intensity of Facebook use will be positively associated with the propensity to use
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 Facebook for classroom collaboration.
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Subjective well-being has been shown to be an important predictor of student 133 perceptions of social capital in past studies of Facebook use (Ellison et al. 2007; Ellison 134et al. 2011; Steinfield et al. 2008). People with higher self-esteem may be more likely to 135approach classmates they may not know well, or to form groups with others, when seeking 136information about the class. Ellison et al. (2007) note an interaction effect such that those 137with lower self-esteem seemed to reap more social capital benefits from their use of the site. 138Similarly, students who are more satisfied with their life at the university may be more 139likely to use Facebook for organizing their academic collaborations because they see others 140 in the larger organization as being helpful. Thus we propose: 141

- H2: Self-esteem will be positively associated with the propensity to use Facebook for 142 classroom collaboration. 143
- H3: Satisfaction with life at the university will be positively associated with the 144 propensity to use Facebook for classroom collaboration. 145

Instructors play an important role in classroom organizing processes. They might 147 disambiguate course goals, help organize students, or create new ambiguities by 148changing assignments or expectations throughout the course of a semester. In our 149model, we include instructor-based Facebook behaviors, such as having a Facebook 150presence, as well as students' perceptions of the appropriateness of instructors' presence 151on the site. Research examining student-instructor relationships suggests that professors 152who have online profiles with high disclosure levels are associated with increased 153student motivation (Mazer et al. 2007) and that self-disclosures decreased uncertainty, 154increased student motivation, and created more positive attitudes toward both the course 155and the professor (O'Sullivan et al. 2004). In Facebook, "Friending" another user 156provides access to more information about that person; thus, we consider a set of 157behaviors that speak to students' desire to use the site to find out more about an instructor 158or to gather information from the instructor through the site (as opposed to traditional 159tools such as email or in-person visits during office hours): 160

H4. Willingness to (a) use Facebook to view the profile of an instructor, (b) contact an 161 instructor through Facebook, and (c) "Friend" an instructor will be positively 162 associated with the propensity to use Facebook for course organizing.
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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 peerto-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 170 the propensity to use Facebook for course organizing? 171

#### Study 1 methods

We obtained a random sample of 1996 students from the registrar's office of a large, 173Midwestern university. Selected students were sent an email inviting them to participate in 174an online survey hosted on Zoomerang on their use of technology and specifically SNSs; 175those who completed the survey could provide their email address for a chance to win one 176of ten \$50 gift certificates. The survey period lasted for approximately 2 weeks in March 177178and 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 179(66%), Caucasian (88%), upperclassmen (58%), and 20.5 years old (S.D.=2.4). 180

#### 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. 186

### Propensity to use Facebook for collaboration (PFC)

Collaboration using Facebook can involve both online-only (e.g., using Facebook as a medium 188 for sharing notes) and online-to-offline (e.g., using the site to arrange a study group) 189 interactions. Both types of collaboration were captured in a four-item scale (Cronbach's 190  $\alpha$ =0.86), with one item measuring online-to-offline collaboration and three items measuring 191 collaboration that may occur either online-only or online-to-offline (see Table 1). 192

### Unapproved use of Facebook

To capture how students may be using Facebook for unapproved collaborative purposes, we 194 included the item, "How likely are you to use Facebook to collaborate on an assignment in 195 a way that your instructor might not like?" (M=2.45, S.D.=0.990). Note that the wording of 196 this item ("might not like") could include behaviors that all instructors would find 197 problematic (such as cheating) as well as those of which some instructors might approve 198 but others would not (such as sharing definitions on a study guide). While the ambiguity of 199

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<b>Table 1</b> Propensity to use Facebook for collaboration scale (PFC)			
Mean	S.D.		
3.66	0.907		
3.53	1.096		
3.33	1.139		
4.01	0.999		
3.78	1.087		
	Mean 3.66 3.53 3.33 4.01 3.78		

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

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Facebook usage was measured through the Facebook Intensity scale (FBI; Ellison et al. 207 2007), which includes number of Friends on the site, time spent on the site, and six Likerttype questions about respondents' emotional engagement with Facebook and integration of 209 the site into their daily lives. This scale ( $\alpha$ =0.86) has been used in other Facebook research 210 (e.g., Tomai et al. 2010; Valenzuela et al. 2009). 211

#### Psychological well-being

Two separate measures comprise students' psychological well-being. Self-esteem was measured213by seven items from the Rosenberg Self-Esteem Scale (Rosenberg 1989). Satisfaction with life214at university was adapted from the Satisfaction with Life Scale (Diener et al. 1997; Pavot and215Diener 1993) which has been used in previous research of college undergraduates (Ellison216et al. 2007). Both measures reported responses on a five-point, Likert-type scale.217

#### Instructor-student Facebook behaviors

Three original items were included to measure the extent to which participants use the site219to interact with instructors. These items, which are all reported on a five-point, Likert-type220scale ("Very Unlikely" to "Very Likely") were presented as follows: "Imagine an instructor221in one of your current classes who you know uses Facebook. How likely are you to do the222following? (1) Browse their profile on Facebook; (2) Contact them using Facebook, or by223using information from Facebook; (3) Add them as a Facebook friend."224

#### Study 1 results

To better understand the propensity to use Facebook for collaboration, we conducted an OLS 226 regression with the PFC scale as the dependent variable. As shown in Table 2, the overall model 227

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	Coefficient	t	р	
(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	
	(Intercept) Gender (Male) Years of undergrad Age (in years) Hours of internet use GPA Facebook intensity Self-esteem Satisfaction with life at university Unapproved use of Facebook View profile of instructor Contact instructor via Facebook Add instructor as friend on Facebook $R^2$	Coefficient(Intercept) $1.074$ Gender (Male) $-0.216$ Years of undergrad $-0.020$ Age (in years) $-0.050$ Hours of internet use $-0.060$ GPA $-0.011$ Facebook intensity $0.285$ Self-esteem $0.069$ Satisfaction with life at university $0.031$ Unapproved use of Facebook $0.266$ View profile of instructor $0.207$ Contact instructor via Facebook $0.147$ Add instructor as friend on Facebook $-0.074$ $R^2$ $0.373$	Coefficientt(Intercept) $1.074$ $2.45$ Gender (Male) $-0.216$ $-2.14$ Years of undergrad $-0.020$ $-0.40$ Age (in years) $-0.050$ $-2.11$ Hours of internet use $-0.060$ $-1.28$ GPA $-0.011$ $-0.24$ Facebook intensity $0.285$ $5.35$ Self-esteem $0.069$ $1.31$ Satisfaction with life at university $0.031$ $0.59$ Unapproved use of Facebook $0.207$ $4.05$ Contact instructor via Facebook $0.147$ $2.13$ Add instructor as friend on Facebook $-0.074$ $-1.04$ $R^2$ $0.373$ Adjusted $R^2$ :	Coefficienttp(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 $R^2$ : $0.348$

<b>Table 2</b> Regression model of propensity to use Facebook for collaboration ( $N$ =
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\*p<0.05, \*\*\*p<0.001

was significant (F(12, 301)=14.92, p<0.001), explaining 35% of the variance in PFC and228identifying a number of factors that are associated with propensity to use Facebook for229collaboration, while controlling for demographic and other variables. All variables except for230gender, year in school, age, and hours of Internet use have been standardized.231

H1 stated that Facebook Intensity would positively predict PFC; results support this 232hypothesis ( $\beta$ =0.285, p<0.001). Neither H2, regarding self-esteem (M=3.92, S.D.=0.398, 233 $\alpha$ =0.88), nor H3, regarding satisfaction with university life (M=3.58, S.D.=0.756,  $\alpha$ =0.84), 234were supported. H4a, browsing an instructor's profile (M=3.29, S.D.=1.293), and H4b, 235contacting the instructor using information from Facebook (M=2.02, S.D.=1.079) were 236both supported, such that respondents who are likely to view an instructor's Facebook 237profile ( $\beta$ =0.207, p<0.001) or to contact the instructor via Facebook ( $\beta$ =0.147, p<0.05) 238were more likely to be using the site for collaboration; however, adding an instructor as a 239Friend (M=2.12, S.D. = 1.148) was not significant, so H4c was not supported. 240

The research question asked whether a relationship existed between students' "unapproved" 241 uses of Facebook and their propensity to use the site for collaboration. Unapproved Use of 242 Facebook positively predicted PFC ( $\beta$ =0.266, p<0.001); however, this practice does not seem 243 widespread, as only 18% reported that they were "Likely" or "Very Likely" to engage in this 244 behavior. This subset of respondents was also significantly more likely to view the profile of a 245 professor (M=3.37 vs. M=3.00, pooled S.D.=1.2, p<0.05) and to contact the instructor via 246 Facebook (M=2.40 vs. M=1.93, pooled S.D.=1.07, p<0.05). 247

#### Study 1 discussion

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Our regression model explored a number of factors that might affect one's propensity to use249Facebook for collaboration in the classroom context, which we operationalized as a set of250activities including collaborating, discussing, or asking questions about schoolwork, and251arranging a study group. Based on previous literature, we envisioned these collaboration252practices as methods for reducing the equivocality inherent in the classroom process.253

Facebook Intensity was a significant predictor of students' propensity to use Facebook 254for collaboration. One reason for this could be that students who spend more time on 255Facebook and have more Friends on the site (two components of Facebook Intensity) 256simply have more opportunities to use it for collaboration than those who spend less time 257and have smaller networks. Another reason could be that those students who use the site 258more often have a more developed skill set and thus are familiar with using the site for 259purposes beyond those that are strictly social. In this case, FBI may act as a rough proxy for 260efficacy in the use of Facebook, enabling them to repurpose the site for purposes like 261262reducing 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 269on Facebook. Respondents who were more likely to view their instructors' Facebook 270profiles were more likely to report engaging in collaboration using Facebook. In the 271classroom, both students and instructors are engaged in a collaborative organizational 272process, but have different goals that are at least partially defined by their roles. Students 273274may be looking for information from Facebook to collect cues about their instructors in order to disambiguate the characteristics of those instructors, including pedagogical styles, 275learning outcomes, or grading trends. Another explanation could be that an intervening 276variable not measured here, such as high motivation to succeed in the class, is affecting 277both PFC and likelihood to seek information about an instructor using Facebook. 278

279Viewing the profile of an instructor and contacting the instructor through Facebook positively predicted participants' propensity to use Facebook for collaboration, but 280Friending an instructor was not statistically significant. This latter finding may reflect 281282students' desire to protect their personal lives from authority figures, especially in light of media reports detailing the negative consequences resulting from universities and employ-283ers gaining access to students' profiles (e.g., Lang 2009). Furthermore, viewing a profile or 284sending a message through Facebook represents an isolated, one-time activity, whereas 285Friending implies a long-term relationship; thus, even students who repurpose the site for 286academic activities may be reluctant to make a Friending commitment to their instructors. 287

Our research question examined the likelihood that students would use Facebook to 288"collaborate on an assignment in a way an instructor might not like." This question reflects 289an alternative framework in which the goals of the students and the goals of the instructor 290may not be aligned in terms of the extent and nature of the collaborative activity. We found 291that this type of interaction was positively related to PFC, meaning that the more likely one 292was to collaborate on an assignment in a way that instructor would not approve of using 293Facebook, the more likely one was to engage in the other activities included in the PFC 294scale. However, the one-item measure of unapproved use is susceptible to reliability and 295validity issues, which we address through Study 2. 296

#### Study 2: Social and psychological predictors of collaboration

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The results from our first study suggest that the more students use Facebook, the more 298 likely they are to engage in collaboration activities via Facebook. We also found that 299

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students who are likely to organize through Facebook are also more likely to contact their300instructors and view instructor profiles through Facebook. There was also a strong positive301relationship between "inappropriate" use of Facebook and collaboration, but an exploratory302factor analysis suggests they are two different factors.303

In Study 2, we address limitations related to the Propensity to use Facebook for Collaboration 304 (PFC) scale and explore the extent to which there are different dimensions to this activity. The 305 results from Study 1 suggested that inappropriate use of Facebook, while not the same as the PFC 306 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 309 inappropriate—in order to more clearly identify different types of collaboration: 310

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 313 life) were not significant predictors of Facebook-enabled collaboration; however, we 314 include self-esteem and satisfaction with life in our second model under the assumption that 315 they may be predictors of certain types of collaboration but not others. Previous work on 316 SNS use by college students has shown that these variables were positive predictors of 317 social capital (Ellison et al. 2007). 318

RQ2: Does the relationship between psychological well-being and use of Facebook for 319 course organizing vary based on the type of collaboration? 320

In Study 1, we were unsure about the mechanism by which Facebook Intensity (FBI) 322 was associated with PFC—was FBI functioning as an indicator of more time spent on 323 Facebook or as a rough proxy of efficacy? Therefore, in Study 2, we introduced Facebook 324 self-efficacy as a more direct measure of the individual's belief in his or her ability to use 325the features of Facebook to accomplish tasks like setting privacy controls, and kept FBI as a 326 control. Self-efficacy is the belief that an individual has about their own capability to do a 327 certain task regardless of their actual technological ability (Bandura 1977). Since Facebook 328 is a collection of different features, the individual's comfort level regarding certain types of 329Facebook use may determine which types of collaboration they engage in: 330

RQ3: What types of Facebook self-efficacy affect the propensity to use Facebook for 331 classroom collaboration? 332

Study 1 found that instructors' presence on Facebook affected students' propensity to 334 collaborate; however, the term "instructor" could refer to a professor or a teaching assistant 335 (TA). Without any evidence that students may perceive professors and TAs differently, we 336 decided to create independent items asking about students' behavior toward professors and 337 TAs. Since we knew from Study 1 that students were engaging in both passive and active 338 forms of communication, we created a more specific measure of using Facebook for active 339 communication: asking for help. We posited that willingness to ask the instructor for help 340through Facebook (a more refined measure compared to Study 1's "contact an instructor 341 through Facebook") would be positively associated with the propensity to use Facebook for 342collaboration: 343

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H2: Willingness to ask a TA for help through Facebook will be positively associated with 346 the propensity to use Facebook for classroom collaboration. 347

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#### Perceived site use contributes to propensity to use Facebook in course organizing 349

The above hypotheses and research questions address psychological characteristics that 350would contribute to an individual's likelihood of engaging in Facebook-related classroom 351collaboration. More recent research on SNS behavior suggests that different 352 communication-based uses of the site will be associated with different outcomes. For 353 instance, Ellison et al. (2011) find that using the site to engage in social information-354seeking, or finding out about proximate others and latent ties, was predictive of bridging 355 and bonding social capital whereas initiating, or using Facebook to try to connect with 356 strangers, was not. Similarly, research within the organizational setting suggests that SNS 357 features may help support the social dimensions of collaboration; DiMicco et al. (2009) 358found that employees reported using an internal SNS to get to know their coworkers 359 through a process they termed people sensemaking. We wished to explore whether different 360 ways of using the site, specifically regarding Facebook-related relational communication 361 activities, were related to students' propensity to use the site for classroom collaboration. 362 We focused on the two strategies (initiating and social information-seeking) that involved 363 strangers and latent ties but did not study use of the third strategy, maintaining, which 364speaks to use of Facebook among close friends. Given the lack of literature on this specific 365point, we ask the following research question: 366

RQ4: What is the relationship between Facebook-related relational communication 367 activities and the propensity to use Facebook for classroom collaboration? 368

#### Study 2 method

Data from a convenience sample of 265 students was collected from three classes in the 370 telecommunication department at a large Midwestern university. Students were invited to 371 participate in an online survey hosted on SurveyGizmo about their use of social network 372 sites. The survey period lasted for 16 days in November and December of 2009. 373 Participants were primarily male (65%) with an average age of 20 (M=20.49, S.D.=2.26) 374 Ninety percent of participants were in-state students, and 5% were international students. 375

#### Measures

Propensity to use Facebook for collaboration To address RQ1, we expanded our measure377of the types of collaboration activities students were engaging in through Facebook beyond378the four items included in PFC. The survey instrument asked students to rate the likelihood379that they would use Facebook for a wide range of tasks, including 12 new items in addition380to the four original items that make up PFC.381

We then conducted an exploratory factor analysis. Using a principal components analysis 382 with a Varimax rotation, two distinct factors emerged, which we labeled "positive 383 collaboration" and "negative collaboration." The positive collaboration scale ( $\alpha$ =0.91) contains 384

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nine items, including arranging a group project, discussing classes or schoolwork, and asking a 385 classmate for help in a class. The negative collaboration scale ( $\alpha$ =0.85) contains three items, 386 including the negative item from Study 1, "collaborate on an assignment in a way the instructor 387 would not like." The full set of items and factor loadings are shown in Table 3. 388

Facebook self-efficacy To measure self-efficacy, we created an original scale. The instrument 389 asked participants to assess the extent to which they felt confident using specific Facebook 390 features and engaging in specific Facebook activities. Responses were reported using a five-391 point Likert-type scale ranging from "Strongly Disagree" to "Strongly Agree. A principal 392 components analysis using Varimax rotation showed four factor loadings with eigenvalues 393 above 1, explaining 64% of total variance; however, only three factors—those with alphas 394 above 0.70—were included in the analysis. Facebook communication self-efficacy (M=3.83, 395 S.D.=0.810,  $\alpha$ =0.81) was a four-item scale about using different communication tools on 396 Facebook to convey messages ("I feel confident using the private message feature on 397 Facebook," "I feel confident posting public messages on one of my Facebook Friend's walls," 398 "I feel confident using the comments feature to respond to status updates and wall posts," and 399 "I feel confident using Facebook Chat to send and receive instant messages (IMs) with my 400Facebook Friends."). Facebook interest self-efficacy (M=3.18, S.D.=1.017,  $\alpha$ =0.83) 401 contained three items about confidence in finding information about one's interest ("I feel 402confident searching for Facebook Groups related to my interests," "I feel confident posting 403 comments to a Facebook Group," and "I feel confident searching for Facebook applications 404 related to my interests"). Facebook privacy self-efficacy (M=4.07, S.D.=0.629,  $\alpha$ =0.73) was 405a three-item scale assessing one's confidence in making changes to privacy settings ("I feel 406confident changing my settings to prevent a Facebook friend from viewing parts of my 407 profile," "I feel confident adjusting the privacy settings on my Facebook account," and "I feel 408 confident untagging myself from photos if I want to"). 409

*Psychological and demographic measures* In addition to psychological and demographic 410 measures used in Study 1, we asked about what grade the student expected to receive for the 411

	Factor loadings
Positive collaboration ( $M$ =2.56, S.D.=.776, $\alpha$ =.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	x761
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	h taken it655
Negative collaboration ( $M$ =3.58, S.D.=.961, $\alpha$ =.85)	
To share homework answers in a way your instructor would not approve o	of893
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

specific class in which they were taking the survey. We anticipated that the course grade may be 412 a better predictor than overall grade point average in that questions were tied to a specific class. 413This variable was not significantly related to the dependent variable, however, and was removed 414 from the regression model to prevent over-fitting. In addition, time spent on the Internet was 415removed because the variable was not useful in the regression model presented in Study 1. 416

Connection strategies Initiating new relationships and social information-seeking measures 417 were drawn from Ellison et al. (2011) Initiating new relationships (M=2.61, S.D.=0.652,  $\alpha=$ 418 0.82) was a five-item scale that asked participants to imagine an unknown student on campus 419420and 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 421 to rate their agreement with the statement, "I use Facebook to meet new people." Social 422 information-seeking (M=2.75, S.D.=0.536,  $\alpha=0.80$ ) contained four items related to students' 423use of Facebook to gather information about other users, including people met socially, in the 424same class, and living nearby, as well as viewing profiles of other students in the same class. 425

#### Study 2 results

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We created two OLS regression models, using propensity of positive and negative collaboration	428
as dependent variables and social, psychological, and demographic factors as the independent	429
variables.	430

#### Explaining propensity to use Facebook for positive collaboration

The first model testing positive collaboration (see Table 4) was statistically significant (F (13, 432 213)=17.632, p < 0.001), with an adjusted  $R^2$  of 0.51. Missing data was not replaced with means. 433

#### t4.1 t4.2 Coefficient t р t4.3 (Intercept) 3.375 0.001 t4.4 Gender (Male) 0.107 2.005 0.047 Years of undergrad t4.50.097 1.441 0.152 -1.446 t4.6 Age (in years) -0.0960.150 t4.7 Facebook intensity 0.087 1.375 0.171 t4.8 Self-esteem -0.084-1.2110.228 t4.9 Satisfaction with life at university 0.066 1.016 0.311 t4.10 Facebook communication self-efficacy 1.855 0.065 0.136 t4.11 Facebook privacy self-efficacy 0.262 4.442 0.000 \*\*\* t4.12 Facebook interest self-efficacy 0.004 0.997 0.000 t4.13 Initiating 0.155 2.823 0.005 \*\* t4.14 -6.683 Social information-seeking -0.4240.000 \*\*\* t4.15 Ask professor for help 1.266 0.207 0.103 t4.16 Ask TA for help 0.157 1.981 0.049 $R^2$ t4.17 0.547 Adjusted R<sup>2</sup>: 0.511

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

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

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Asking a professor for help through Facebook (M=2.31, S.D.=1.035) had no significant 434 impact on positive collaboration; therefore, H1 was not supported. However, students who 435tried to ask the TA for help (M=2.46, S.D.=1.067) were more likely to collaborate 436 positively ( $\beta$ =0.157, p<0.05), supporting H2. 437

Addressing the research questions, neither self-esteem nor satisfaction with university life 438were related to propensity to engage in positive collaboration (RQ2); however, students with 439higher self-efficacy in Facebook privacy settings ( $\beta$ =0.262, p<0.001) were more likely 440 to engage in positive collaboration (RQ3). Facebook interest and Facebook communica-441 tion self-efficacy were non-significant. Students more likely to initiate new relationships 442  $(\beta=0.155, p<0.05)$  were more likely to engage in positive collaboration (RQ4). Students 443 more likely to engage in social information-seeking ( $\beta$ =-0.424, p<0.001) were less likely 444 to organize positively (RQ4). Of the demographic variables, only gender was significant: 445males were more likely than females to collaborate positively through Facebook. 446

#### Explaining propensity of negative collaboration

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Our regression model (Table 5) explaining negative collaboration (F(13, 178)=10.702, 448 p < 0.001) was statistically significant and had an adjusted R<sup>2</sup> of 0.42. Missing data were not 449replaced with means. 450

Asking a professor for help through Facebook had no significant impact on negative 451collaboration; therefore, H1 was not supported. However, students who tried to contact the 452 TA were more likely to collaborate negatively ( $\beta$ =0.359, p<0.001), supporting H2. 453

We found that the psychological well-being variables of self-esteem and satisfaction with 454university life (RQ2) played a significant role in explaining the propensity to collaborate 455negatively. Students who had high self-esteem ( $\beta$ =-0.287, p<0.001) were less likely to 456collaborate negatively, whereas students with high satisfaction with university life were 457more likely to collaborate negatively ( $\beta = 0.203$ , p < 0.05). 458

	Coefficient	t	р	
(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 459 collaborate negatively ( $\beta$ =-0.170, p<0.05). Facebook privacy and Facebook communication self-efficacy, however, were non-significant. 461

Initiating relationships on Facebook ( $\beta$ =0.203, p<0.05) was a positive predictor of 462 likelihood to collaborate negatively (RQ4). On the other hand, students who were more 463 likely to engage in social information-seeking ( $\beta$ =-0.186, p<0.05) were less likely to 464 collaborate negatively (RQ4). 465

Of demographic variables, only the year of college was significant. Students who were 466 more senior in their college career were more likely to collaborate negatively than those in 467 their early years of college ( $\beta$ =0.247, p<0.01). 468

Study 2 discussion

Our findings suggest that there are two variants of collaboration, which we label positive and 470 negative. This finding addresses our first research question about types of collaboration. Study 471 2 results indicate that the four items for collaboration we had used for Study 1 only explained 472positive collaboration (see Table 3). Given that there seem to be differences in what predicts 473whether students engage in either positive or negative collaboration (see Tables 4 and 5), one 474interpretation is that students have different beliefs about the normative use of Facebook. Four 475items, including "getting notes when you've missed a class" and "finding out what material 476will be on a quiz or test" cross-loaded onto both positive and negative collaboration factors 477 and were removed. Since factor analysis shows patterns of answers, this suggests that cross-478479loaded 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 480collaboration (cheating) if it happens before the exam, but could also be interpreted as sharing 481 an instructor-provided study guide (more likely to be seen as positive collaboration) which 482 was why this item was not included in either positive or negative scales. 483

We found that psychological well-being variables correlate only with self-reported 484 negative collaboration activities (RQ2). Students with low self-esteem were more likely to 485collaborate negatively, consistent with previous research showing that students with low 486self-esteem are more likely to cheat (McCabe 2007). Surprisingly, students with higher 487 satisfaction with university life were more likely to collaborate negatively. This finding 488 bears further investigation, as we do not have an empirically grounded interpretation of this 489relationship. One possibility could be that students view university life in a way that we 490were unable to capture in this study (e.g., as a social rather than academic experience). 491

Study 2 showed that Facebook self-efficacy is related to one's propensity to collaborate492through Facebook. However, a granular investigation of different types of self-efficacy493reveals that not all forms of self-efficacy are positively associated with the likelihood to494collaborate. For positive collaboration, we found that *Facebook privacy self-efficacy*, which495assesses participants' perceived ability to use Facebook's tools to control their privacy, was496a significant positive predictor.497

For negative collaboration, however, we found that *Facebook privacy self-efficacy* was 498not a significant predictor. Rather, a lack of Facebook interest self-efficacy, the perceived 499ability to use Facebook to find topics of interest, was associated with the likelihood to 500collaborate negatively. We had expected that Facebook privacy self-efficacy would be 501related to negative collaboration, as the ability to control privacy options may allow the user 502to engage in behaviors that might be sanctioned with less fear of reprisal. Given the lack of 503a relationship between these variables, it could be that an intervening variable is affecting 504505this relationship. This relationship requires further study.

Our two hypotheses about seeking help from instructors through Facebook revealed 506surprising results. Students who were more likely to ask their TA for help using 507Facebook were more likely to collaborate both positively and negatively. These results 508suggest that students who collaborate through Facebook are more likely to engage in 509multiple types of uses of the tool to seek information about their class and achieve their 510goals, regardless of whether they intend to use positive or negative collaboration to do so. 511In particular, asking the TA for help through Facebook had a high coefficient (.359) in the 512model explaining negative collaboration and was significant at the  $p \le .001$  level. Students 513may engage in multiple, parallel information-seeking activities to advance their goals 514within the classroom, both in positive and negative collaborations. Consequently, using 515Facebook, as well as formal channels, to interact with instructors represents a "spread 516spectrum" strategy in which the student is accessing multiple communication channels to 517ensure success. 518

The perceived propensity to ask professors questions using Facebook was not 519significantly related to either positive or negative collaboration. It could be that the smaller 520age difference between teaching assistants and undergraduate students (compared to faculty 521and students) may affect the perceived appropriateness of using Facebook as a 522communication channel, since TAs are typically graduate students who may only be a 523few years older than the respondents. For communication with their professors, students 524may prefer more formal methods of communication such as e-mail or in-person 525conversations during office hours, which would be reified by formal communication 526policies set forth in syllabi. On the other hand, students may also assume their professors do 527not have Facebook accounts or rarely log onto the site. It could also be that students see 528norms of interacting in a space where social self-presentational content may be intermingled 529with professional self-presentational content to be more of a risk with professors rather than 530with TAs. Alternatively, the inability to resolve issues involving the professor in the first 531place may lead students to seek help from other people, such as classmates or TAs. 532

Finally, we examined two communication-based variables: initiating new relation-533ships via Facebook and social information-seeking, which captured activities associated 534with using the site to find out information about proximate others. These variables 535significantly explained the propensity to use Facebook for both positive and negative 536collaboration. Initiating new relationships was a significant positive factor: since 537classroom collaboration takes place in a loosely coupled system where students often 538do not know each other prior to taking the same class, students who are more likely to 539use the site to initiate new relationships (which is not a normative use; see Ellison et al. 5402011) might be more likely to engage in activities associated with collaboration, such as 541creating a study group. Even though students may come to know each other over time 542within one class, or across multiple classes, in large universities they often enter classes 543as strangers to one another. The propensity to initiate relationships with strangers 544captured in the "initiating" scale may indicate a greater willingness to interact with 545unknown people to accomplish overall goals. 546

However, students who were more likely to use Facebook to engage in social 547information-seeking—learning information about people with whom they had some kind 548of offline connection-were less likely to collaborate in both positive and negative 549contexts. This could be because students who score highly in social information seeking 550through Facebook see the site as a social medium, and are less likely to map its use to work 551purposes. Items such as "I use Facebook to learn more about other people in my classes" 552could refer to either learning about others for work (collaboration) purposes or more social 553554uses; future work should explore this finding in more depth.

#### Discussion

We conducted two studies: the first study examined whether or not students were engaging 556in collaboration, as well as the demographic variables and types of instructor-student 557communication that predict their likelihood to collaborate using Facebook. We developed a 558four-item scale labeled "propensity to use Facebook for collaboration" and conducted an 559OLS regression to ascertain the relationship between a number of demographic and 560academic variables and students' propensity to collaborate through Facebook. We found 561that students who were likely to use Facebook to interact with their instructor in various 562ways were more likely to collaborate using Facebook. We did not find any significant 563results regarding psychological well being, but found an interesting relationship between a 564one-item item—"collaborating in a way your instructor would not approve"—and the 565propensity to collaborate using Facebook. 566

Study 1 raised a number of new questions, especially regarding our measure of 567collaboration, which we explored further in Study 2. First, we refined the concept of 568collaboration: based on the strong relationship between unapproved use of Facebook in 569Study 1, we added several more items describing different types of collaborative activities 570and conducted a factor analysis, which confirmed two distinct factors of negative and 571positive collaboration. We re-examined the role of psychological well-being separately in 572the contexts of negative and positive collaboration and added some new constructs; 573Facebook self-efficacy was introduced to assess the skill level of the students, along with 574two variables describing social behaviors on the site (initiating new relationships and social 575information-seeking). We also included separate items about professors and teaching 576assistants (TAs). 577

This study provides several important findings. The first is that psychological well-being 578variables affect the propensity of negative collaboration, but not positive collaboration. 579Students with high self-esteem were less likely to collaborate negatively but students with 580high self-esteem were not necessarily more likely to collaborate positively. This supports 581research on self-esteem suggesting that high self-esteem does not necessarily predict good 582performance (Baumeister et al. 2003). Self-esteem is not necessarily a trait that professors 583consider in their pedagogy, but these findings could be of interest to health service groups 584within colleges, who often deal with the psychosocial health of students. 585

Second, communication practices on the site, such as using the site to learn more about 586 others or to connect with strangers, are predictive of both types of collaboration. Likelihood 587 of initiating new relationships on Facebook increased propensity to collaborate, while the 1 likelihood of using Facebook to look up information about people from offline contexts 589 decreased propensity to collaborate. Similar to other trends in SNS research, this points to a 590 need to consider specific communication practices when studying use of the site (as 591 opposed to global measures of time on site or other more generic assessments). 592

Third, certain types of Facebook self-efficacy have a significant effect on collaboration. 593 Higher Facebook self-efficacy regarding privacy settings increases the likelihood to 594 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, 597 suggesting that confidence in more information-seeking skills could reduce the propensity of negative collaboration. 599

Fourth, Facebook Intensity (FBI) was a statistically significant and important variable in 600 Study 1, but neither as significant nor as important in Study 2. As we controlled for more ways 601 of using Facebook, we found that the estimates for FBI in Study 2 were lower because our other 602

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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. 607

We found in Study 1 that students who view the Facebook profiles of their instructors 608 and attempt to contact them through the site are more likely to use Facebook to collaborate. 609Previous research has suggested that many students do not want their instructors to have a 610 presence on the site (Hewitt and Forte 2006). Our findings support this to some extent since 611 "friending an instructor" was not a significant factor in explaining propensity to collaborate. 612 However, in Study 2, we found that although fewer students were using Facebook to 613 connect with their instructors, the likelihood of asking an instructor for help on Facebook 614 significantly explained the propensity to collaborate in the case of teaching assistants but 615not professors. In combination with other research showing that few students are using 616 Facebook to interact with their instructors (Madge et al. 2009; Salaway et al. 2008), our 617 findings suggest that professors who eschew Facebook may be missing an opportunity to 618 engage with their students and encourage them to use alternative methods to reduce 619 equivocality about their classes. It is also very likely that many students and professors 620 perceive certain norms regarding how Facebook should be used, which reduces the 621 likelihood of collaborating through Facebook. Future research should continue to monitor 622 this relationship, as these norms may shift over time. 623

#### 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. 628

Additionally, both studies involved sampling biases that should be considered when 629generalizing results. Study 1 involved a random sample from a large, public university in 630 the U.S. These students may be more used to large classes, and may be more likely to come 631 from local secondary schools, than students in private or community colleges. Study 2 632 involved students in courses from a technology-oriented department, which may increase 633 the propensity of those students to both use and re-use technology. We have no evidence 634 that these biases affected results, but would argue for caution in generalizing these results 635 more broadly. 636

#### Conclusion

Facebook is a tool that is widely used by college students as a social communication 638 platform. Some of these users are repurposing Facebook as a tool for classroom organizing 639 and supporting collaborations that are instructor-sanctioned—as well as those that are not. 640 These findings complement a growing corpus of research that explores outcomes of SNS 641 use. Popular media have suggested that students' use of SNSs is related to poorer academic 642 643 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 644 645 see SNSs as predominantly social or entertainment systems (Joinson 2008). We found that

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some students are using Facebook to collaborate around classroom activities, which may 646 lead to new forms of classroom interactions that support the loosely coupled, time-bound 647 nature of the class as an organization. Future work should assess whether these activities are 648 likely to result in positive outcomes, such as increased interest in the course, gains in 649 school-related self-efficacy, or higher levels of engagement with course content. While we 650do not expect Facebook to independently cause a paradigmatic shift in students' 651educational experiences, the repurposing of a tool that the vast majority of students are 652accessing on a daily basis has the potential to support new forms of interaction between 653 students and instructors. 654

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