The relationship between frequency of Facebook use, participation in Facebook activities, and student engagement

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ABSTRACT

Educators and others are interested in the effects of social media on college students, with a specific focus on the most popular social media website—Facebook. Two previous studies have examined the relationship between Facebook use and student engagement, a construct related to positive college outcomes. However, these studies were limited by their evaluation of Facebook usage and how they measured engagement. This paper fills a gap in the literature by using a large sample ($N = 2368$) of college students to examine the relationship between frequency of Facebook use, participation in Facebook activities, and student engagement. Student engagement was measured in three ways: a 19-item scale based on the National Survey of Student Engagement, time spent preparing for class, and time spent in co-curricular activities. Results indicate that Facebook use was significantly negatively predictive of engagement scale score and positively predictive of time spent in co-curricular activities. Additionally, some Facebook activities were positively predictive of the dependent variables, while others were negatively predictive.

1. Introduction

1.1. College student use of Facebook

There is a fair amount of professional and popular interest in the effects of social media on college student development and success (Abramson, 2011; Kamenetz, 2011). The most popular social media website for college students is Facebook, and research shows that anywhere between 85 and 99% of college students use Facebook (Hargittai, 2008a; Jones & Fox, 2009; Matney & Borland, 2009). Researchers from the Pew Internet and American Life Project found that between 67% and 75% of college-aged young adults (who may not necessarily be enrolled in college) use social networking websites (Jones & Fox, 2009; Lenhart, 2009; Lenhart, Purcell, Smith, & Zickuhr, 2010). The most recent data, collected by the EDUCAUSE Center for Applied Research (ECAR) from a sample of 36,950 students from 126 U.S. universities and one Canadian university, showed that of the 90% of students who use social networking websites, 97% said they used Facebook. This 97% reported actively engaging on the site daily (Smith & Caruso, 2010).

While the percentage of students who use social media and Facebook is high, it is important to acknowledge that there are persistent differences along gender, racial, and socioeconomic lines in technology adoption and use, often referred to as the *digital divide* (Cooper & Weaver, 2003; DiMaggio, Hargittai, Celeste, & Shafer, 2004; Hargittai, 2008b; Junco, Merson, & Salter, 2010; Kaiser Family Foundation, 2004). The studies listed examined the digital divide on the Internet and in communication technologies; however, Hargittai (2008a) conducted the only published academic study of gender, ethnic, and socioeconomic differences between users and non-users of social networking websites. She found that Latino students are less likely to use Facebook than Caucasians and that students whose parents have a college degree are more likely to use Facebook than students whose parents do not have a college degree (Hargittai, 2008a).

While there is little research on the consequences of Facebook use by college students, some studies have examined the relationship between Facebook use and psychosocial outcomes. For example, there is a positive relationship between using Facebook and forming and maintaining social capital, which is defined as "the resources accumulated through the relationships among people" (Ellison, Steinfield, &

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Lampe, 2007, p. 1145). Valenzuela, Park, and Kee (2009) found that intensity of Facebook use was related to civic participation, life satisfaction, and social trust. In a more recent study, Ellison, Steinfield, and Lampe (2011) extended their previous work and found that engaging in social information-seeking behaviors on Facebook (for instance, to learn more about people with whom the user has an offline connection) was related to increased social capital, while using Facebook to maintain close ties and to meet strangers without any previous offline connection were not. Research by Tufekci (2008) found that expressive uses of the Internet (such as reading blogs, creating web pages, emailing, etc.) were related to the adoption of social networking websites by students.

Two studies examined how college students felt about faculty use of Facebook. Roblyer, McDaniel, Webb, Herman, and Witty (2010) found that, contrary to popular belief, only 15% of students reported that they would feel their privacy was invaded by faculty encouraging educational uses of Facebook. Indeed, students in the Roblyer et al. (2010) study reported being more interested than faculty in using Facebook for educational purposes. A small-scale survey (Mazer, Murphy, & Simonds, 2007) found that students who experienced more instructor self-disclosure on Facebook reported more motivation and higher levels of learning. In contrast, research by Moran, Seaman, and Tinti-kane (2011) found that 77% of faculty engaged in personal uses of social media and 60% of faculty reported using social media in class. However, only 4% of faculty surveyed reported using Facebook in class. These data suggest that while students may feel comfortable with educational applications of Facebook, faculty are not ready to engage with them in such uses.

Because of the viral speed with which the use of Facebook and other social networking technologies is growing among college-aged youth (Jones & Fox, 2009; Matney & Borland, 2009; Smith & Caruso, 2010), there is a great deal of popular and academic interest in the impact these technologies may have on student academic outcomes (Abramson, 2011; Kamenetz, 2011). According to Kuh (2009), at least one of these outcomes—student engagement—is positively related to multiple desired outcomes of a college education (such as cognitive development, psychosocial development, self-esteem, locus of control, moral and ethical development, and persistence).

1.2. Student engagement

In 1984, Alexander Astin proposed his developmental theory of college student involvement, which he later renamed "engagement." Astin (1984) defined engagement as "the amount of physical and psychological energy that the student devotes to the academic experience" (p. 297). His theory of student engagement was based on five tenets: 1) Engagement refers to the investment of physical and psychological energy; 2) Engagement occurs along a continuum (some students are more engaged than others and individual students are engaged in different activities at differing levels); 3) Engagement has both quantitative and qualitative features; 4) The amount of student learning and development associated with an educational program is directly related to the quality and quantity of student engagement in that program; and 5) The effectiveness of any educational practice is directly related to the ability of that practice to increase student engagement.

Today, engagement is conceptualized as the time and effort students invest in educational activities that are empirically linked to desired college outcomes (Kuh, 2009). Engagement encompasses various factors, including investment in the academic experience of college, interactions with faculty, involvement in co-curricular activities, and interaction with peers (Kuh, 2009; Pascarella & Terenzini, 2005). Kuh (2009) emphasizes two major aspects: in-class (or academic) engagement and out-of-class engagement in educationally relevant (or co-curricular) activities, both of which are important to student success.

Since 1984, the construct of engagement has been extensively researched. As Kuh (2009) states: "student engagement and its historical antecedents…are supported by decades of research showing positive associations with a range of desired outcomes of college" (p. 698). While an exhaustive review of the research on engagement is beyond the scope of this paper, it is important to note the key findings regarding engagement. In their meta-analysis of how college affects students, Pascarella and Terenzini (2005) highlight the relationship between student engagement, student development, and success:

1. College environments that emphasize close interactions between faculty and students are related to improved critical thinking, knowledge acquisition, analytic competencies, and intellectual development.
2. Close on-campus friendships and engagement in college-sponsored activities maximize persistence and educational attainment.
3. Environments that emphasize engagement in class discussions and involvement with faculty in the academic community maximize psychological adjustment and maturity; students' perception of faculty as accessible, caring, and helpful promotes persistence and degree completion.
4. Extracurricular involvement has a positive effect on persistence and educational attainment, women's choice of nontraditional careers, and development of a positive social self-concept.
5. The higher the level of student engagement in academic work and in the academic experience of college, the greater his/her level of knowledge acquisition and cognitive growth.
6. Interaction with peers is a powerful force in student persistence and degree completion.

To summarize, academic and co-curricular engagement are powerful forces in both student psychosocial development and academic success. Even minority students, first generation students, and students who are not adequately prepared for college academic work see improvements in grades and persistence with increased engagement (Kuh, Cruce, Shoup, Kinzie, & Gonyea, 2008; Pascarella & Terenzini, 2005). While student engagement has been extensively researched in offline environments (Pascarella & Terenzini, 2005), little research exists on the relationship between student engagement and social media use.

1.3. Facebook and student engagement

It makes sense to examine the relationship between Facebook use and student engagement for two general reasons: 1) today's college students use Facebook at high rates, as illustrated by the statistics presented in the introduction and 2) Facebook intends to be an engaging platform going so far as to measure their success in terms of user engagement (Heiberger & Harper, 2008; Morrin, 2007). Therefore, it is possible that students may be using Facebook in ways that influence or are influenced by real-world engagement. More specifically, we can conceptualize student use and involvement on Facebook along Astin's (1984) five tenets of engagement:

1) *Engagement refers to the investment of physical and psychological energy*: Students invest a great deal of psychological energy in using Facebook, as evidenced by usage statistics;
2) *Engagement occurs along a continuum*: Some students are more engaged on Facebook than others, while some don't use social media at all;
3) *Engagement has both quantitative and qualitative features*: Students can spend a great deal of time using Facebook (quantitative feature) and may engage in a wide variety of activities on the platform (qualitative features);
4) *The amount of student learning and development associated with an educational program is directly related to the quality and quantity of student engagement in that program*: It is possible that Facebook use is related to real-world student engagement in some tangible ways.
5) *The effectiveness of any educational practice is directly related to the ability of that practice to increase student engagement:* If Facebook indeed increases engagement, it is possible for Facebook to be used in educationally relevant ways to improve student academic outcomes.

Indeed, two published studies focusing specifically on social media and student engagement have found a relationship between time spent online and student engagement in the real-world (as described by Astin (1984) and measured through single survey items): Heiberger and Harper (2008) conducted a study of 377 undergraduate students at a Midwestern institution, while the Higher Education Research Institute (HERI, 2007) used the Your First College Year (YFCY) survey to collect data from over 31,000 students at 114 colleges and universities. The Heiberger and Harper (2008) study focused solely on Facebook use, while the HERI (2007) study focused on all social networking websites. Both the Heiberger and Harper (2008) and HERI (2007) studies found positive correlations between social networking website use and college student engagement. For instance, a higher percentage of high users of social networking websites participated in and spent more time in campus organizations than low users. Additionally, more of the high users reported that they interacted daily (in the real-world) with close friends and felt strong connections to them (HERI, 2007). One other study (Tufekci, 2008) found that users of social networking websites had increased weekly contact with friends as compared to non-users, but this study was not focused on student engagement.

1.4. Purpose of the study and research questions

Up to this point, published studies on the effects of Facebook on student engagement have been limited by their measurement of time spent using Facebook and their measurement of engagement. For example, both the HERI (2007) and the Heiberger and Harper (2008) studies used non-continuous measures of time spent on Facebook (i.e., 1–2, 3–5, 6–10 h) and single-item measures of student engagement. Another limitation is that previous studies have focused only on frequency of Facebook use and have not examined what students are doing while on Facebook. Indeed, the Facebook platform allows for a range of activities—varying from commenting on user content, to sending private messages, to uploading photos, to lurking (seeing what others are up to)—that theoretically would impact outcomes differentially. One study, using a small sample, examined the activities students engaged in on Facebook; however, the authors did not relate those findings to other measures (Pempek, Yermolayeva, & Calvert, 2009).

As of this writing, no studies have measured the relationship between the type of Facebook activity and academic outcomes like student engagement. Nevertheless, other areas of Internet research have progressed in this direction. Research in the area of psychological well-being has shown that, in addition to frequency of Internet use, online activities are important in predicting psychological well-being (Cotten, 2008; Gordon, Juang, & Syed, 2007; Morgan & Cotten, 2003). Ellison et al. (2011) found that using Facebook for social information-seeking (but not other connection strategies) was related to increased social capital, while Pempek et al. (2009) found that students used Facebook to facilitate pre-established peer social relationships primarily by communicating via public comments. While not focusing on Facebook, a study by Junco, Heiberger, and Loken (2010) lends support to the idea that online activities matter; they found that using Twitter in educationally relevant ways led to increases in student engagement. Twitter is a microblogging and social networking platform that allows users to post 140-character updates similar to Facebook's status updates. Overall, it appears that other areas of Internet research have moved from assessing the impact of general uses of technology to more nuanced examinations of activities engaged in while using those technologies. Given the results in related research areas, it is reasonable to believe that types of Facebook activities matter when examining student engagement.

The current study serves to extend previous research by examining the relationship between Facebook use and student engagement. This study uses multiple measures of frequency of Facebook use and frequency of engaging in various types of Facebook activities, and it measures engagement using an instrument developed specifically to assess the construct of student engagement. The study also evaluates the relationship between Facebook use and two variables related to student engagement: time spent preparing for class (academic engagement) and time spent in co-curricular activities (co-curricular engagement). While the effect of gender, ethnicity, and socioeconomic status are important variables in Facebook use, neither of the previous studies on Facebook use and engagement took them into account in their analyses. In this study, we include these as control variables.

The research questions examined were:

Question 1a: Is there a relationship between frequency of Facebook use and student engagement?
Question 1b: Is there a relationship between frequency of Facebook activities and student engagement?
Question 2a: Is there a relationship between frequency of Facebook use and time spent preparing for class?
Question 2b: Is there a relationship between frequency of Facebook activities and time spent preparing for class?
Question 3a: Is there a relationship between frequency of Facebook use and time spent in co-curricular activities?
Question 3b: Is there a relationship between frequency of Facebook activities and time spent in co-curricular activities?

2. Methods

2.1. Participants

All students ($N = 5414$) at a medium, 4-year, public, primarily residential institution in the Northeast were surveyed. During the Fall 2010 semester, students were contacted through their on-campus email accounts and sent a link to a survey hosted on SurveyMonkey.com,

a commercial survey-hosting website. Two additional reminders were sent, each one week apart. Participants were offered a chance to enter a drawing to win one of 90 $10 Amazon.com gift cards as an incentive. A total of 2368 surveys were completed for an overall response rate of 44%.

2.2. Instrument and measures

The National Survey of Student Engagement (NSSE) is an established instrument that was developed to measure engagement in educationally relevant activities and the desired outcomes of college (Kuh, 2009; Pascarella & Terenzini, 2005). The NSSE exhibits acceptable psychometric properties (Kuh, 2002), and those items that focus on good practices in undergraduate education consistently predict development during the first year of college, based on multiple objective measures (Pascarella, Seifert, & Blaich, 2009). Items from the larger NSSE have been used to develop shorter scales to measure engagement in educationally relevant practices and engagement in online courses (Chen, Lambert, & Guidry, 2010; Kuh et al., 2008).

This study used a 19-item NSSE scale developed by Junco, Heiberger et al. (2010) to measure engagement. The scale was created by selecting 19 items from the NSSE that measure academic and co-curricular engagement (see Appendix A). The 19-item engagement scale was administered as part of a larger survey that also included demographic items, items inquiring about a student's technology use, and items that were included for forthcoming analyses. Engagement scale items 1–14 were coded using a four-point, positively anchored Likert scale ranging from "Never" to "Very often." For these analyses, "Never" was coded as 1, "Sometimes" as 2, "Often" as 3, and "Very often" as 4. Question 15–17 were presented as a seven-point, positively anchored Likert scale and were coded with responses 1 or 2 as "1," responses 3 or 4 as "2," responses 5 or 6 as "3," and response 7 as "4." Responses for question 18 were coded 1 for "Very little," 2 for "Some," 3 for "Quite a bit," and 4 for "Very much." Lastly, responses for question 19 were coded 1 for "Poor," 2 for "Fair," 3 for "Good," and 4 for "Excellent." The original NSSE scaling was kept for the 19 items used in this study, and the seven-point scale used for questions 15–17 was recoded in order to keep those items on the same four-point scale as the other questions. An aggregate engagement score was created using the sum of the individual items.

To provide multiple measures for accuracy checks in reporting, students were asked to estimate their time spent on Facebook (FBTime) as well as how often they checked Facebook (FBCheck). They were asked to evaluate average time spent daily and time spent "yesterday," as well as the average number of times they checked Facebook daily and "yesterday." FBTime was evaluated by asking students: "On average, about how much time per day do you spend on the following activities?" and "How much time did you spend on each of these activities yesterday?" with prompts for Facebook. Students used a pull-down menu to select the hours and minutes spent using Facebook. FBCheck was evaluated by asking students: "On average, how many times per day do you check Facebook?" and "How many times did you check Facebook yesterday?" and allowing them to input an open-ended number. The hours and minutes spent using Facebook were converted to minutes for these analyses.

Students were also asked to estimate the frequency with which they conducted various activities on Facebook. As the possible types of Facebook activities change over time because of addition or deletion of features, the list of Facebook activities was developed just before the current study by soliciting input from the author's Facebook network. The author's Facebook network includes a mix of undergraduate and graduate students, researchers, faculty members, technology industry professionals and personal friends. A public status update was posted stating: "I need your help for my next research project. What are the things that you do on Facebook?" The items submitted by 39 members of the network were then collated and compiled into a non-overlapping list of 14 items. In the author's opinion, these 14 items encapsulate the major categories of Facebook activities.

These 14 items were shared with two separate groups of undergraduate students for input, revised, and then posted on Facebook for further comments. While all of the items from the original list were kept, many were edited for clarity and relevance. The final list of 14 items can be seen in Appendix B. Students were asked: "How frequently do you perform the following activities when you are on Facebook? Facebook activity items were coded using a five-point, positively anchored Likert scale ranging from "Never" to "Very Frequently (close to 100% of the time)." For these analyses, "Never" was coded as 1; "Rarely (25%)" as 2; "Sometimes (50%)" as 3; "Somewhat frequently (75%)" as 4; and "Very frequently (close to 100% of the time)" as 5.

Lastly, students were asked to estimate the average amount of time they spent preparing for class and engaging in co-curricular activities (such as involvement in campus organizations, campus publications, student government, fraternity or sorority, intercollegiate or intra-mural sports, etc.) each week. As with time spent on Facebook, answers to these questions were converted to minutes for these analyses.

2.3. Engagement instrument reliability and validity

Analysis of the engagement instrument showed that the data from the current administration were internally consistent with a Cronbach's α of .80. The Cronbach's α estimate in this study was similar to the .74 and .81 estimates reported by Junco, Heiberger et al. (2010) on the same 19-item scale. Also, the Cronbach's α estimate was similar to the Cronbach's α of .82 reported by Kuh et al. (2008) and the α of .85 reported by Hytten (2010) using a different 19-item scale from the NSSE. Lastly, the Cronbach's α level for this study was also similar to the α of .85 obtained by examining data on the 22 college activity items (Kuh, 2002).

Evidence was collected to support the construct validity of the 19-item engagement scale by correlating the total score on the scale to the number of minutes students reported spending in co-curricular activities in a typical week. Because, theoretically, students who are more engaged in general spend more time participating in co-curricular activities, one way to show evidence of construct validity of the engagement instrument would be if the scores on the engagement instrument correlated somewhat (i.e., shared some of the variance) with the amount of time students spent in co-curricular activities. Furthermore, the conceptual underpinnings of the engagement instrument as well as the reliability data suggest that the instrument is an omnibus measure of student engagement encompassing both academic and co-curricular aspects of engagement. Indeed, there was a weak, yet significant, correlation between scores on the engagement instrument and average minutes per week students reported spending in co-curricular activities (Pearson's $r = .281, p < .001$). Again, this is congruent with similar analyses conducted by Junco, Heiberger, et al. (2010).

2.4. Data analyses

The data were downloaded as an SPSS file directly from SurveyMonkey, screened for anomalies, and analyzed using PASW (formerly SPSS) Statistics 18.0. Descriptive statistics were conducted to illustrate the demographic characteristics of the sample as well as their use of Facebook. Correlations were examined to evaluate the relationship between the Facebook frequency-of-use measures. To answer the research questions, six hierarchical (blocked) linear regression analyses were conducted to determine which factors influence the three dependent variables: engagement scale score, time spent preparing for class, and time spent in co-curricular activities. Using hierarchical linear regression allows the researcher to choose the number and order of predictors inserted into the model, "blocking" or grouping them based upon a theoretical construct. The blocks, in order, were: demographic variables (gender, ethnicity, and highest parental education level), frequency of Facebook use (FBTime or FBCheck), and frequency of Facebook activities. The blocks were selected for the following reasons: demographic variables were included in their own block because previous research has found an important effect of gender, socioeconomic status, and/or ethnicity in relation to technology use (Cooper & Weaver, 2003; DiMaggio et al., 2004; Hargittai, 2008b; Junco, Merson et al., 2010; Kaiser Family Foundation, 2004); frequency and activities were included in separate blocks to evaluate the relative impact of each as previous research has shown that online activities often matter more than time spent online when evaluating outcomes (Cotten, 2008; Ellison et al., 2011; Gordon et al., 2007; Junco & Cotten, 2010; Junco, Heiberger et al., 2010; Morgan & Cotten, 2003; Pempek et al., 2009). Categorical variables were dummy-coded for purposes of the regression analyses. The reference categories for these variables were: female, Latino students, and "some college" for highest parental education.

Analyses were conducted to test whether the data met the assumptions of regression analyses. To test for collinearity and important outliers, collinearity diagnostics and examinations of residuals were performed. The curve estimation procedure of PASW was used to examine the linearity of the relationships in the data. Curve estimation was used to plot both linear and quadratic functions to examine linearity. The curve estimation, collinearity, and outlier analyses showed that the assumptions for regression were met. However, the analyses also indicated there were nine outliers on FBCheck (reporting they checked Facebook over 80 times per day). These nine outliers were removed from further analyses thereby reducing the sample size to 2359 students. Since FBTime and FBTime "yesterday" were highly and significantly correlated (Pearson's $r = .79$, $p < .001$), only FBTime was used in the analyses. Furthermore, since FBCheck and FBCheck "yesterday" were also highly and significantly correlated (Pearson's $r = .83$, $p < .001$), only FBCheck was used in the analyses.

3. Results

3.1. Descriptive statistics

Sixty-four percent of those who took the survey were female and 36% were male. The mean age of the sample was 22 with a standard deviation of 6. The age of participants ranged from 17 to 61, although over 78% were between 18 and 22 years old. Thirty one percent of students in the sample were in their first year, 22% were sophomores, 20% were juniors, and 27% were seniors. Highest educational level attained by either parent was as follows: 28% had a high school degree or less, 24% completed some college, 34% were college graduates, and 14% had a graduate degree. In terms of race and ethnicity, the sample was overwhelmingly Caucasian with 89% of students listing that as their race. Additionally, 5% of the sample was African American, 2% were Latino, 1% were Asian American, and 3% identified as "other" (Native Americans were included in "other" because there were only four in the sample). The gender, race, and ethnic breakdown of the sample was similar to that of the overall university population, with the exception of a slight overrepresentation of women in this sample. Scores on the engagement scale ranged from 23 to 74, with a mean of 49.4 (SD 8). Students reported spending a mean of 750.75 (SD 642.24) minutes (or 12.5 h) per week preparing for class and spending, on average, 298.50 (SD 438.32) minutes (or 5 h) per week participating in co-curricular activities.

3.2. Facebook usage

Students in this sample spent a substantial amount of time on Facebook. They:

- Spent a mean of 101.09 min (SD 99.16) on the site per day
- Spent a mean of 74.97 min (SD 86.82) on the site "yesterday"
- Checked Facebook a mean of 5.75 (SD 6.78) times per day
- Checked Facebook a mean of 4.8 (SD 6.71) times "yesterday."

There were significant but moderate correlations between FBCheck and FBTime (Pearson's $r = .487$, $p < .001$) and between FBCheck "yesterday" and FBTime "yesterday" (Pearson's $r = .493$, $p < .001$). Students participated in a variety of Facebook activities, with viewing photos, commenting on content, and checking in to see what others are doing being the three most popular activities (see Fig. 1). Frequencies of Facebook activities found in the current study were generally congruent with those reported by Pempek et al. (2009), although the Pempek et al. study used a different measurement scale and didn't examine the same activities.

3.3. Regression analyses

3.3.1. Research questions 1a and 1b

Both hierarchical linear regressions predicting engagement scale score using FBTime ($F_{(24,2321)} = 7.543$, $p < .001$, Adjusted $R^2 = .063$) and FBCheck ($F_{(24,2326)} = 7.394$, $p < .001$, Adjusted $R^2 = .061$) as predictors were significant. In the FBTime model, being male ($\beta = .053$, $p < .05$), having a parent (or parents) with an advanced graduate degree ($\beta = .071$, $p < .01$), commenting ($\beta = .081$, $p < .05$), and creating or RSVP'ing to events ($\beta = .136$, $p < .001$) were all positive predictors of engagement; while FBTime ($\beta = -.090$, $p < .001$), playing games ($\beta = -.102$, $p < .001$), and checking up on friends ($\beta = -.065$, $p < .05$) were negative predictors of engagement. In the FBCheck model, the same pattern
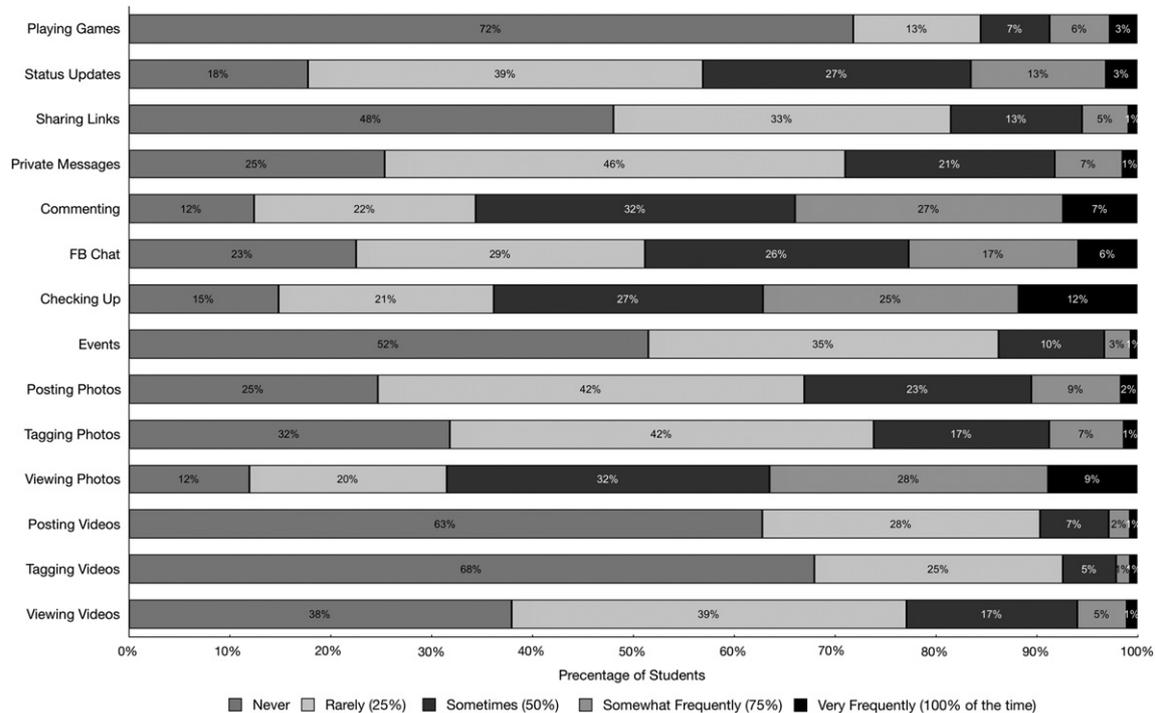
Fig. 1. Frequency of participating in Facebook activities.

emerged, with being male ($\beta = .055$, $p < .01$), having a parent (or parents) with an advanced graduate degree ($\beta = .072$, $p < .01$), commenting ($\beta = .079$, $p < .05$), and creating or RSVP'ing to events ($\beta = .136$, $p < .001$) being positive predictors of engagement; while FBCheck ($\beta = -.068$, $p < .01$), playing games ($\beta = -.118$, $p < .001$), and checking up on friends ($\beta = -.061$, $p < .05$) being negative predictors.

3.3.2. Research questions 2a and 2b

The hierarchical linear regressions predicting time spent preparing for class, using FBTime ($F_{(24,2321)} = 2.737$, $p < .001$, Adjusted $R^2 = .017$) and FBCheck ($F_{(24,2326)} = 2.594$, $p < .001$, Adjusted $R^2 = .016$) as predictors, were both significant. In the FBTime model, being male ($\beta = -.095$, $p < .001$) and chatting on FB chat ($\beta = -.086$, $p < .01$) were negative predictors of time spent preparing for class. In the FBCheck model, the same pattern emerged, with being male ($\beta = -.093$, $p < .001$) and chatting on FB chat ($\beta = -.098$, $p < .001$) being negative predictors.

3.3.3. Research questions 3a and 3b

The hierarchical linear regressions predicting time spent in co-curricular activities using FBTime ($F_{(24,2321)} = 6.713$, $p < .001$, Adjusted $R^2 = .055$) and FBCheck ($F_{(24,2326)} = 6.511$, $p < .001$, $R^2 = .053$) as predictors were both significant. In the FBTime model, being male ($\beta = .106$, $p < .001$), FBTime ($\beta = .050$, $p < .05$), commenting ($\beta = .113$, $p < .01$), creating or RSVP'ing to events ($\beta = .136$, $p < .001$), and viewing photos ($\beta = .082$, $p < .01$) were all positive predictors of engagement, while having a parent with a high school degree as their highest educational level ($\beta = -.053$, $p < .05$), playing games ($\beta = -.074$, $p < .001$), checking up on friends ($\beta = -.088$, $p < .01$), and posting photos ($\beta = -.097$, $p < .01$) were negative predictors of engagement. In the FBCheck model, a similar pattern emerged, with being male ($\beta = .103$, $p < .001$), commenting ($\beta = .116$, $p < .01$), creating or RSVP'ing to events ($\beta = .136$, $p < .001$), and viewing photos ($\beta = .085$, $p < .01$) being positive predictors of engagement, while having a parent with a high school degree as their highest educational level ($\beta = -.050$, $p < .05$), playing games ($\beta = -.064$, $p < .01$), checking up on friends ($\beta = -.082$, $p < .01$), and posting photos ($\beta = -.102$, $p < .01$) being negative predictors of engagement. There was one exception to the pattern of similar results: FBCheck was not significant in the FBCheck model.

3.4. Summary

Each of the six models significantly predicted the dependent variables of either engagement scale score, time spent preparing for class, and time spent in co-curricular activities. Table 1 lists the positive and negative predictors across all models, arranged in order of strength. In all four of the analyses where the second block did not result in a significant R^2 change, introduction of the Facebook activities resulted in a statistically significant increase in R^2. Therefore, interpretation of the R^2 changes and the β weights suggest that Facebook activities predicted more of the variance in the three dependent variables than demographic variables and frequency-of-use.

Even though FBTime was a significant negative predictor of engagement scale score, it was not the strongest predictor either in size of the β coefficient or in size of the R^2 change when entering the time block versus the Facebook activities block. The same holds true for prediction of time spent in co-curricular activities; while FBTime was a significant positive predictor, it was not the strongest predictor. Overall, the introduction of the Facebook activities block resulted in a statistically significant positive change in R^2 in all four analyses where the time block did not result in a significant R^2 change. Furthermore, the β weights for Facebook activities were larger than those for FBTime and FBCheck.

Also of interest was the finding that while FBTime and FBCheck were significantly correlated, the variance shared between the two variables was moderate. The correlation between FBCheck and FBTime was .487, and between FBCheck "yesterday" and FBTime "yesterday," .493. Squaring Pearson's r gives the proportion of variance shared between the two variables in a correlation. Therefore, FBCheck and FBTime

Table 1
List of positive and negative predictors of engagement scale score, time spent preparing for class, and time spent in co-curricular activities, listed by strength of prediction (Highest Standardized β from Block 3 Reported in Parentheses).

Positive Predictors	Negative Predictors
Creating or RSVPing to Events (.136)	Playing Games (−.118)
Commenting (.116)	Posting Photos (−.102)
Male (.106)	FB Chat (−.098)
Viewing Photos (.086)	Male (−.095)
Advanced Graduate Degree (.072)	FBTime (−.090)
FBTime (.050)	Checking Up on Friends (−.088)
	FBCheck (−.068)
	Parental High School Degree (−.051)

shared 24% of variance while FBCheck "yesterday" and FBTime "yesterday" also shared 24%. Placing this result within the context of the results of the regression analyses of Facebook use and co-curricular activities (which found that FBTime was a significant predictor, while FBCheck was not) suggest that these two are different behaviors. In other words, the amount of time spent on Facebook is not very related to the number of times Facebook is checked. An example would be the difference between one student who checks Facebook twice a day for 2 h each time and another who checks Facebook ten times a day for 2 min each time.

4. Discussion

4.1. Research questions

Question 1a: Is there a relationship between frequency of Facebook use and student engagement?
Question 1b: Is there a relationship between frequency of Facebook activities and student engagement?

The answer to both questions is yes: FBTime and FBCheck were both negatively predictive of engagement scale score. Furthermore, frequency of playing games and checking up on friends were also negatively predictive of engagement scale score while commenting on content and creating or RSVP'ing to events were positively predictive of engagement scale score. Even though FBTime was significantly negatively predictive of engagement scale score, examination of β weights and R^2 change show that creating or RSVP'ing to events and playing games were both stronger predictors of engagement scale score. Additionally, while FBCheck was significantly negatively predictive of engagement scale score, creating or RSVP'ing to events, playing games, and commenting were stronger predictors of engagement.

Unlike research conducted by HERI (2007) and Heiberger and Harper (2008), data from the current study show that time spent on Facebook was negatively predictive of student engagement. While the use of Facebook does involve psychological energy, it does not seem that that investment is related in a positive way to the real-world construct of engagement as conceptualized by Astin (1984) and Kuh (2009) and as measured by the engagement scale. In fact, time spent on Facebook is negatively related to engagement. Furthermore, communicative activities (commenting and creating or RSVP'ing to events) are positively related to engagement while non-communicative activities (playing games and checking up on friends) are negatively related. This dichotomy has been noted across activities on the Internet with communicative uses predicting better psychosocial outcomes (Cotten, 2008).

Question 2a: Is there a relationship between frequency of Facebook use and time spent preparing for class?
Question 2b: Is there a relationship between frequency of Facebook activities and time spent preparing for class?

There was no relationship between frequency of Facebook use and time spent preparing for class; however, there was a significant negative relationship between frequency of engaging in Facebook chat and time spent preparing for class. A study by Junco and Cotten (2010) found that students who spent more time chatting online reported more academic impairment. While academic impairment was not evaluated in the current study, the negative relationship between engaging in Facebook chat and time spent preparing for class suggests that there is something about the process of online chatting that detracts from schoolwork; a topic important to explore in future research.

Question 3a: Is there a relationship between frequency of Facebook use and time spent in co-curricular activities?
Question 3b: Is there a relationship between frequency of Facebook activities and time spent in co-curricular activities?

The answer to both of these questions is yes. FBTime is positively related to time spent participating in co-curricular activities, unlike the relationship between FBTime and engagement scale score. However, FBCheck was not related to time spent in co-curricular activities. Frequency of playing games, checking up on friends, and posting photos were negatively predictive of time spent in co-curricular activities while commenting on content, creating or RSVP'ing to events, and viewing photos were positively predictive.

These results are consistent with results from HERI (2007)) and Heiberger and Harper (2008)—that time spent on Facebook is related to real-world involvement on campus. These results are also congruent with Valenzuela et al.'s (2009) finding that intensity of Facebook use was related to civic participation and Tufekci's (2008) finding that users of social networking websites had more real-world contact with friends than non-users. Further support is the fact that creating or RSVP'ing to events was a significant positive predictor of both engagement scale score and involvement in campus activities. In the case of participation in co-curricular activities, psychological energy on Facebook relates in a positive way to one of the facets of the real-world construct of engagement as conceptualized by Kuh (2009). That is, time spent on Facebook is significantly and positively related to out-of-class engagement, an important facet in the overarching construct of student engagement.

While there seems to be a similar distinction between communicative and non-communicative activities in this model as with the engagement scale score model, additional predictors (viewing photos and posting photos) at first do not seem to fit this distinction. It is possible that posting photos and viewing photos are different activities in both process and outcomes—that is, students who post photos are

involved in technical aspects of transferring photos from a camera to their computer and then selecting and uploading them to Facebook. On the other hand, students who are viewing photos may be involved in either reliving a moment or event shared with friends or making decisions about future events (i.e., "that looks like a good time, maybe I'll get together with my friends to do that again").

4.2. General discussion

While other researchers (Heiberger & Harper, 2008; HERI, 2007) have found that Facebook use is positively related to engagement, results from this study show that time spent on Facebook is both positively and negatively related to engagement and that specific Facebook activities are related to engagement. Moreover, Facebook activities are stronger predictors of student engagement, time spent preparing for class, and time spent in co-curricular activities than time spent on Facebook. This is congruent with research on general uses of the Internet that shows that online activities are either as important or more important than time spent when predicting outcomes (Cotten, 2008; Ellison et al., 2011; Gordon et al., 2007; Junco, Heiberger et al., 2010; Morgan & Cotten, 2003).

Therefore, in a natural setting and when left unguided, students will use Facebook in ways that are both positively and negatively related to their engagement, studying, and on-campus involvement. The fact that using Facebook in certain ways is positively predictive of student engagement in the real-world suggests that some of the ways in which students use Facebook are related to the positive academic outcomes reported with increases in student engagement (Kuh, 2009; Pascarella & Terenzini, 2005). The relationship between Facebook use and engagement discovered in this study can be understood in the context of the five tenets of Astin's (1984) theory of student engagement. Specifically:

1) *Engagement refers to the investment of physical and psychological energy*: Results from this study show that students spend a great deal of psychological energy using Facebook, checking Facebook, and engaging in a variety of Facebook activities;
2) *Engagement occurs along a continuum*: As evidenced by usage data, some students use Facebook a great deal, while others do not. Furthermore, there is variability in the types of Facebook activities in which students engage;
3) *Engagement has both quantitative and qualitative features*: This tenet was strongly supported by the current study as it relates to time spent on Facebook and Facebook activities. Some activities were predictive of engagement, while others weren't. For instance, creating or RSVP'ing to events and commenting on content are activities that engage the user in interactions with others; and certainly interacting with events would be related to actually attending those events in the real-world, as that is the purpose of the Facebook events feature. Conversely, playing games and checking up on friends require little of the same energy—one need not interact with others to "check up" on them and playing games seems to be contrary to the nature of Facebook as a service that is designed to afford users the ability to engage with and share with one another. The most impactful Facebook activities in terms of engagement outcomes, like Astin's (1984) first tenet of student engagement, seem to be those where students invest the most psychological energy, and possibly the most physical energy if, in fact, creating or RSVP'ing to events on Facebook translates into real-world attendance at those events. Indeed, this interpretation of Astin's (1984) theory is supported by the examining the beta weights in the regression models where creating or RSVP'ing to events was significant—it was always the strongest predictor;
4) *The amount of student learning and development associated with an educational program is directly related to the quality and quantity of student engagement in that program*: The model predicting time spent in co-curricular activities showed that both time spent on Facebook and creating or RSVP'ing to events were positive predictors. In their meta-analysis, Pascarella and Terenzini (2005) concluded that engagement in co-curricular activities maximizes persistence and educational attainment and that interaction with peers is a powerful force in student persistence and degree completion. Therefore, it is entirely possible that student use of Facebook is related to co-curricular involvement in some ways that maximize student academic success. While not directly measured in this study, future research may want to investigate the links between engagement with events on Facebook, attendance at actual events, and academic success.
5) *The effectiveness of any educational practice is directly related to the ability of that practice to increase student engagement:* Clearly, the use of Facebook is related to engagement in the real-world. Furthermore, engagement in certain Facebook activities is also related to engagement in the real-world. While this study found both positive and negative predictors, it is possible that faculty and administrators could develop educational practices that include using Facebook in ways that maximize both engagement and academic benefits. Indeed, there is already evidence to support this notion—that technologies that students are already using can be repurposed in ways that improve engagement and educational outcomes (Junco, Heiberger et al., 2010).

4.3. Limitations

The major limitation of this study is that it is cross-sectional and correlational in nature, and therefore it is impossible to determine the causal mechanisms between Facebook use and engagement. While the data show that engagement and Facebook use are related, the direction of the effect is difficult to determine. For instance, students who spend more time commenting on Facebook also score higher on the engagement scale; however, it could be that students who are more engaged to begin with spend more time commenting on Facebook. Furthermore, other as-yet-to-be-measured variables may be causally linked to both engagement and Facebook use. For instance, dispositional variables such as risk taking and outgoing personality have been shown to be related to types of Facebook use and should be examined in future research on engagement (Underwood, Kerlin, & Farrington-Flint, 2011). Further longitudinal and controlled studies are needed in order to determine the mechanism of causation. A related limitation is that, while this sample was representative of the overall university population on which it is based, it may not be representative (with respect to racial, ethnic, and income factors) of all institutions in the United States. Future research will want to replicate this study with more diverse samples in terms of race, ethnicity, income, and academic institutions.

A further limitation related to the sample is that these analyses did not allow for a more finely-tuned analysis of individual differences in the relationship between Facebook use and engagement. In this study, being male was positively predictive of engagement scale score but

negatively predictive of time spent preparing for class and time spent in co-curricular activities. Having a parent with an advanced graduate degree as their highest educational level was positively predictive of engagement scale score, while having a parent with a high school degree as their highest educational level was negatively predictive of time spent in co-curricular activities. Research on gender differences in engagement has yielded inconsistent results, with female students sometimes reporting greater engagement and male students sometimes reporting more engagement. Furthermore, this relationship is complicated by the gender composition of the institution and by how engagement is measured (Tison, Bateman, & Culver, 2011). Given the importance of these individual differences on outcomes, future research should examine the relationships among gender, parental educational level, ethnicity, institutional gender composition, Facebook use, and engagement.

Another limitation was that the proportion of the variance predicted by the models was low, with the highest being 6.3% and the lowest 1.6%. While this is consistent with similar research on predictors of technology use (Hargittai, 2008a; Junco, Merson et al., 2010), it suggests that there is a large proportion of variance in student engagement that is explained by other variables; an idea that is congruent with the literature on engagement (Pascarella & Terenzini, 2005). It will be important for future research to elucidate other variables that may be more highly predictive of engagement either through observational or experimental designs. However, that being said, it is important to note that all of the models were significant, and therefore, while the proportion of the variance explained is low, the predictors contribute in some meaningful way to the three outcome variables.

Using a single model of student engagement is an additional limitation of this study. Specifically, the Astin (1984) model is but one way to think about student engagement, and the NSSE but one way to measure it. Astin's (1984) theoretical model conceptualizes engagement as the time and effort students invest in educational activities. While this is an appropriate way to conceptualize engagement for the current study, future studies may want to examine different ways to capture the construct of engagement. One example is Finn's (1989) taxonomy of student engagement, which includes three progressive levels: acquiescence to school, initiative taking, and social involvement. Additionally, engagement can be measured with surveys other than the NSSE, via interviews or through classroom observations (Finn, 1993). Future studies should consider other engagement theories and include additional measures such as observable classroom interactions.

A final limitation was that Facebook frequency and activities were assessed via self-report. Further research studies will want to attempt to make assessments of actual time spent on Facebook, either through observations or other methods of logging. Moreover, it is important to note that the construct of engagement was measured through self-report and not by observing actual student engagement. Congruent with other research, the engagement instrument appeared to measure engagement adequately; however, it is important to further investigate evidence of the instrument's relationship to actual indices of engagement (Junco, Heiberger et al., 2010). Future research should measure indices of actual engagement (such as observation of classroom behavior) as dependent variables to attempt to determine the best way to measure engagement and to support data collected using the engagement instrument.

5. Conclusion

Both time spent on Facebook and time spent engaged in certain Facebook activities can be positively predictive, negatively predictive, or positively and negatively predictive of engagement, depending on the outcome variable. For example, time spent on Facebook is positively predictive of time spent in co-curricular activities while playing games on Facebook is negatively predictive. These results are congruent with others that have found that using the Internet (Cotten, 2008; Gordon et al., 2007; Morgan & Cotten, 2003) and Facebook (Ellison et al., 2011) in certain ways leads to better psychosocial outcomes, and that using Twitter (Junco, Heiberger et al., 2010) in certain ways leads to better academic outcomes. Therefore, Facebook use in and of itself is not detrimental to academic outcomes, and can indeed be used in ways that are advantageous to students.

Higher education administrators, faculty and staff have an opportunity to help students use Facebook in ways that are beneficial to their engagement and, by extension, to their overall academic experience. Given that Facebook continues to be popular among college students, and that universities are interested in engaging and retaining students, it is important for those working in higher education to familiarize themselves with Facebook (and other such technologies) and to design and support interventions that meet students where they are—in order to help them get to where they are going.

Appendix. Supplementary data

Supplementary data related to this article can be found online at doi:10.1016/j.compedu.2011.08.004.

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