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Student class standing, Facebook use, and academic performance

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ABSTRACT

Although some research has shown a negative relation between Facebook use and academic performance, more recent research suggests that this relation is likely mitigated by multitasking. This study examined the time students at different class ranks spent on Facebook, the time they spent multitasking with Facebook, as well as the activities they engaged in on the site ($N = 1649$). The results showed that seniors spent significantly less time on Facebook and spent significantly less time multitasking with Facebook than students at other class ranks. Time spent on Facebook was significantly negatively predictive of GPA for freshmen but not for other students. Multitasking with Facebook was significantly negatively predictive of GPA for freshmen, sophomores, and juniors but not for seniors. The results are discussed in relation to freshmen transition tasks and ideas for future research are provided.

Unquestionably, Facebook is the most popular social networking site (SNS) in the both the United States and Europe (Ellison, Steinfield, & Lampe, 2007; Hampton, Sessions Goulet, Rainie, & Purcell, 2011; Madge, Meek, Wellens, & Hooley, 2009; Stutzman, 2006). Of all social networking site users, 92% use Facebook (Hampton et al., 2011) while 71% of all adult Internet users use Facebook (Pew Research Internet Project, 2014). While Facebook is popular with all Internet users, it is even more so with college students. Research shows that between 67% and 75% of college-aged adults used SNS (Jones & Fox, 2009; Lenhart, 2009; Lenhart, Purcell, Smith, & Zickuhr, 2010). The last time they asked the question in their yearly study, the EDUCAUSE Center for Applied Research (ECAR) found that 90% of college students used Facebook with a majority (58%) using it several times a day (Dahlstrom, de Boor, Grunwald, & Vockley, 2011). In large sample studies conducted at single institutions, 92% of students reported using Facebook and spending an average of over one hour and forty minutes a day on the site (Junco, 2012a,b).

Facebook is also the most popular social media website used by higher education faculty for personal purposes. Seaman & Tinti-Kane (2013) found that 57% of faculty members reported visiting Facebook "at least monthly." They also found that 8.4% of faculty reported using Facebook for teaching purposes, much more than Twitter but less than blogs and wikis, podcasts, and LinkedIn. Some scholars have suggested that using Facebook for teaching and learning can promote active learning, student engagement, support knowledge construction, and be used as a communication tool congruent with the preferences of today's students (Junco, 2012b; McLoughlin & Lee, 2010; Selwyn, 2010). Greenhow (2011) suggests that social network sites like Facebook can be used as environments that support learning but also as places where youth learn as well as environments that can help youth be more civically and academically engaged.

Facebook has been the most researched platform for teaching and learning (Manca & Ranieri, 2013; Tess, 2013). In their review, Manca and Ranieri (2013) discovered 23 empirical studies of using Facebook as a learning environment. Manca and Ranieri (2013) identified five main educational uses of Facebook: 1) Support class discussions and helping students engage in collaborative learning; 2) Developing content; 3) Sharing educational resources; 4) Delivering content to expose students to extra-curricular resources; and 5) To support self-managed learning. They note that only four studies have examined how Facebook relates to learning outcomes and found positive impacts on learning outcomes such as improvement in English writing skills, knowledge, and vocabulary (Manca & Ranieri, 2013). Robelia, Greenhow, and Burton (2011) examined a Facebook application designed to raise awareness about climate change. They found that users of the app reported above average knowledge of climate change science and reported increased pro-environmental behaviors because of peer role modeling on the site (Robelia et al., 2011).

Facebook has been used as a replacement for learning and course management system (LCMS) discussion boards. For instance, Hurt et al. (2012) examined student outcomes from and preferences for Facebook use. They assigned students to either use Facebook or the learning management system (LMS) in two courses. They found that the Facebook group reported better educational outcomes than the LMS group. They also found that 43% of the LMS users said they would have contributed more if they had used Facebook; while only 12% of Facebook users said they would have participated more with a switch to the LMS. Hollyhead, Edwards, and Holt (2012) found that students

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preferred to create their own Facebook groups when no official-course related ones were available instead of using the LMS. Schroeder and Greenbowe (2009) found that while only 41% of a Chemistry class joined the course Facebook group, the number of posts on Facebook were 400% greater than on the course management system. Furthermore, they reported that postings on the Facebook group "raised more complex topics and generated more detailed replies" than postings on the CMS (Schroeder & Greenbowe, 2009).

Because of its popularity with students, its popularity with faculty, and its potential to support teaching and learning, it is important to understand the relation between Facebook use and student learning. Researchers have examined how Facebook is related to various aspects of the college student experience including engagement (Junco, 2012b), multitasking (Junco, 2012c; Junco & Cotten, 2012), political activity (Vitak et al., 2011), life satisfaction, social trust, civic engagement, and political participation (Valenzuela, Park, & Kee, 2009), development of identity and peer relationships (Pempek, Yermolayeva, & Calvert, 2009), and relationship building and maintenance (Ellison, Steinfield, & Lampe, 2011; Ellison et al., 2007; Valenzuela et al., 2009). Although research has been conducted on other facets of the student experience, little research exists examining how Facebook relates to student learning (Aydin, 2012; Junco, 2012a; Kirschner & Karpinski, 2010; Kolek & Saunders, 2008; Manca & Ranieri, 2013; Pasek, More, & Hargittai, 2009; Tess, 2013).

Facebook use and educational outcomes

Academic performance

In the broadest sense, the desired outcomes of a college education include subject area content achievement, general education knowledge, the acquisition of skills such as critical thinking, moral development, development of civic engagement skills, and psychological maturation (Hersh, 2009; Pascarella & Terenzini, 2005). However, research on college outcomes focuses alomost exclusively on academic performance and persistence (Robbins et al., 2004). Academic performance is typically measured by cumulative GPA which is connected to class and subject matter achievement (Robbins et al., 2004). In addition to being the most common measure of academic performance in the literature on college outcomes, GPA is the sole measure of academic performance used in the literature on Facebook (Junco, 2012a; Kirschner & Karpinski, 2010; Kolek & Saunders, 2008; Pasek et al., 2009).

Research on the relation between Facebook use and academic performance has yielded mixed results. Pasek et al. (2009) found there was no relation between Facebook use and grades. Kolek and Saunders (2008) found that there were no differences in overall grade point average (GPA) between users and non-users of Facebook. Kirschner and Karpinski (2010), on the other hand, found that Facebook users reported a lower mean GPA than non-users; additionally, Facebook users reported studying fewer hours per week than non-users (Kirschner & Karpinski, 2010). Lastly, Junco (2012a) found that number of logins and time spent on Facebook were related to lower overall GPA; however, sharing links and checking to see what friends are up to were positively related to GPA. Junco (2012a) also found that there was a negative relation between time spent on Facebook and time spent preparing for class.

There are a number of possible reasons for the disparate findings among studies. The studies may have been limited by the measures used to evaluate Facebook use and/or grades. These studies may have also been limited due to their sampling designs (Junco, 2012a). For instance, Facebook use was measured in different ways such as through a measure of time spent on the site (Junco, 2012a) or by splitting users and non-users (Kirschner & Karpinski, 2010). Additionally, grades were measured either through self-report (Kirschner & Karpinski, 2010; Kolek & Saunders, 2008; Pasek et al., 2009) or through data collected from the university registrar (Junco, 2012a). Furthermore, there may be differences in how students use Facebook and how this relates to academic outcomes, a factor examined in only one of the studies (Junco, 2012a).

Relationship building and maintenance

As students transition into and move through college, they have to develop new skills in order to be successful (Upcraft, Gardner, Barefoot, & Associates, 2005). Some of these skills are academic such as learning how to engage in progressively more difficult levels of academic work. For instance, as first year students transition to college, they need to learn how to manage their time so that they spend an appropriate amount of time studying for their courses (Upcraft et al., 2005). Social skills are equally important for student success. An important social task for new college students is the building and maintenance of friendships at their new institution (Pascarella & Terenzini, 2005; Tinto, 1993; Upcraft et al., 2005).

Students use Facebook to maintain their former network of high school friends and also to build and sustain bonds with new friends on their campuses (Ellison et al., 2007, 2011; Junco & Mastrodicasa, 2007). They use Facebook to initiate and maintain friendships and to seek out new information about those in their social circle (Ellison et al., 2011). The practice of social information seeking is related to student's perceived levels of social capital (the resources obtained from their relationships and interactions such as emotional support; Ellison et al., 2011). Social capital is related to improved self-esteem, fewer psychological and behavioral problems, and improved quality of life (McPherson et al., 2014). Furthermore, increased social capital can help students feel more of a connection to their institution, which is related to more positive educational outcomes (Pascarella & Terenzini, 2005).

Facebook use can help a student connect with a new peer group as well as maintain relationships with their high school friends in order to mitigate feelings of homesickness thereby allowing them to develop new connections while keeping the support of their old ones. Such interactions are important for student success: students who interact a great deal with their peers, who have broad social ties and reciprocated relationships, and who have strong bonds in their social network are more likely to persist to graduation (Eckles & Stradley, 2011; Pascarella & Terenzini, 2005; Thomas, 2000). Indeed, Yu, Tian, Vogel, and Kwok (2010) showed that Facebook use was directly related to developing relationships, which mediated the association between Facebook use and self-esteem, satisfaction with university life, and the student's evaluation of their own performance.

Multitasking and academic outcomes

While Facebook use can help students develop new connections in their transition to college, researchers have found that students are likely to multitask while using the platform (Junco & Cotten, 2011, 2012). For this paper, multitasking is defined as "consumption of more than one item or stream of content at the same time" and is described in cognitive science research as task switching (Ophir, Nass, & Wagner, 2009, p. 15,583; Tombu et al., 2011). Today's college students multitask more than any other generation of students (Carrier, Cheever, Rosen, Benitez, & Chang, 2009; Rosen, Carrier, & Cheever, 2013; Rosen, Lim, Carrier, & Cheever, 2011). Carrier et al. (2009) examined the multitasking behaviors of different generations and found that those in the "Net Generation" (born after 1978) multitasked significantly more and reported that multitasking was "easier" than older generations. The market firm Wakefield Research surveyed 500 college students and found that 73% said they were not able to study without some form of technology and 38% reported that they couldn't go more than 10 minutes without checking an electronic device such as their phone or laptop (Kessler, 2011).

While today's students multitask a great deal, much research has shown the detrimental effects of multitasking on human information

processing. In 1967, Welford introduced the concept of a "cognitive bottleneck" which is a limitation in decision-making seen when trying to perform two tasks that slows down the second task. For instance, trying to attend to more than one task at a time "clogs" up the bottleneck by overloading the capacity of the human information processing system (Koch, Lawo, Fels, & Vorländer, 2011; Marois & Ivanoff, 2005; Strayer & Drews, 2004; Tombu et al., 2011; Wood & Cowan, 1995). Since Welford (1967) described the cognitive bottleneck, numerous studies have supported its existence. In more recent times, Koch et al. (2011) found that there were significant performance costs in accuracy and reaction time when switching between two auditory stimuli. Additionally, Tombu et al. (2011) found that participants responded more slowly and had poorer accuracy on dual task trials than on single task trials. Therefore, there are real-world consequences associated with a reduced ability for information processing which include a lessened awareness of stimuli, disruption of decision-making, and behavioral impairment on one or more tasks.

The real-world consequences of multitasking can affect educational outcomes (Fried, 2008; Junco, 2012a,c; Junco & Cotten, 2011, 2012; Karpinski, Kirschner, Ozer, Mellott, & Ochwo, 2012; Rosen et al., 2011; Wood et al., 2012). The connection between multitasking and educational outcomes is especially important given the high rates of technology use by today's college students as well as university "laptop initiatives" that encourage or require students to own a laptop computer (Carrier et al., 2009; Weaver & Nilson, 2005). Having a laptop computer in class might increase the possibility that students will engage in multitasking, leading to reduced academic performance. Indeed, research has shown that unstructured use of laptops in class (i.e., not incorporating them into the learning process) is related to performing more off-task activities such as checking email and playing games (Kay & Lauricella, 2011). Presumably, these off-task activities would lead to more negative educational outcomes. In fact, Fried (2008) found that laptop use was negatively related to multiple learning outcomes such as course grades, how much attention students reported paying to lectures, reported clarity of lectures, and understanding of course material.

Research has examined how students are using technology during study periods and class times. Junco and Cotten (2011) found that students who reported studying while IMing were more likely to report that IM interfered with their completion of their schoolwork (Junco & Cotten, 2011). In a similar, yet more recent study, Junco and Cotten (2012) surveyed another large sample of students about how they used technology while studying; they also collected GPA data directly from university records. Junco and Cotten (2012) found that there was a negative relation between student use of Facebook and texting while studying and overall GPA (Junco & Cotten, 2011). However, they found that other activities such as emailing, searching for content not related to courses, talking on the phone, and instant messaging were not related to GPA, even though emailing and searching were conducted at rates equal to Facebook use and at much lower rates than text messaging (Junco & Cotten, 2011). In a related study, Junco (2012c) found that even though emailing and searching were conducted at rates equal to using Facebook, only Facebooking and text messaging during class were negatively related to semester GPA while emailing and searching during class were not. These latter studies suggest that there is something unique about technologies like Facebook and text messaging that more negatively impacts educational outcomes when using them during the learning process.

Two recent studies have used experimental designs to test the effects of multitasking on learning. A study by Wood et al. (2012) assigned students to one of four experimental conditions that had students use Facebook, text messaging, IM, or email during a 20-minute simulated lecture and three control conditions. Students who used Facebook scored significantly lower on tests of lecture material than those who only took notes using paper and pencil. Rosen et al. (2011) had students watch a 30-minute lecture video while responding to text messages sent by the researchers. Students were split into three groups based on frequency of received messages: a low group (that received 0–7 messages), a moderate group (8–15 messages), and a high group (16 or more messages). Immediately after the session, students were given an information posttest. The high group performed worse by one letter grade than the low group; however, there was no difference in posttest scores between the moderate group and the two other groups. The results of the Junco (2012c), Junco and Cotten (2012), Wood et al. (2012), and Rosen et al. (2011) studies all suggest that some ways that technologies are used and some types of technologies may not be as detrimental to academic performance as suggested by previous research in information processing.

The "cognitive bottleneck" theory has been supported by decades of research on information processing (Welford, 1967). Specifically, researchers such as Koch et al. (2011), Marois and Ivanoff (2005), Strayer and Drews (2004), Tombu et al. (2011), and Wood and Cowan (1995) have all found that attempting to focus on more than one task at the same time interferes with awareness, memory, decision-making, and task performance. If their findings were congruent with previous research, Junco (2012c), Junco and Cotten (2012), Wood et al. (2012), and Rosen et al. (2011) would have discovered performance deficits across all technologies. Certainly, the detrimental performance effect of focusing on multiple tasks should extend to broader measures of learning outcomes.

One possibility for this discrepancy is the load that certain technologies place on working memory. Fockert (2013) reviewed recent research on *load theory*, which suggests that a person's ability to effectively multitask depends on working memory resources. In other words, when working memory is taxed, a person is more likely to be distracted by additional stimuli. Fockert (2013) states "there is much evidence that processing of task-irrelevant information is enhanced when load on a concurrent task of working memory is high, implying that working memory plays a role in the active control against distractor interference." (p. 5). Load theory may explain the discrepancies in research conducted by Junco (2012c), Junco and Cotten (2012), Wood et al. (2012), and Rosen et al. (2011). Perhaps social technologies like Facebook and text messaging require more working memory resources than do other technologies like emailing. Furthermore, there may be a threshold level at which working memory is taxed to the point that learning detriments are seen, such that as found in the Rosen et al. (2011) study.

Purpose of the study and research questions

Research suggests there are differences in how well students can regulate their Facebook usage (Rouis, Limayem, & Salehi-Sangari, 2011) and their multitasking while using Facebook (Karpinski et al., 2012). Furthermore, research suggests that in order to be successful, first year college students must effectively learn to balance academic and social demands in their new academic environment (Tinto, 1993; Upcraft et al., 2005). Specifically, incoming students must adjust to college-level work by increasing the quality and quantity of their self-directed academic study while at the same time engaging with a new social support system (Tinto, 1993; Upcraft et al., 2005).

While some research has found a negative relation between Facebook use and academic performance, newer research has revealed that the relation is possibly mitigated by multitasking (Karpinski et al., 2012). Therefore, it is hypothesized that time spent on Facebook while trying to do schoolwork will be negatively related to academic performance. Given that students have to learn to balance social and academic demands as they move from their first-year through their senior year in order to be successful, it is hypothesized that the relation between Facebook use and academic performance will be different based on the student's class standing (Tinto, 1993; Upcraft et al., 2005). Specifically, since first year students are focused on important friendship building and maintenance

tasks, they might be less able to regulate their Facebook use to the detriment of their academic performance.

The research questions examined for the current study are:

Question 1: How much time do students from different class standings spend using Facebook while doing schoolwork and how much time do they spend on Facebook while they are not doing schoolwork?

Question 2: Which Facebook activities do students engage in as a function of class standing?

Question 3: Do the relation between using Facebook while doing schoolwork and GPA and using Facebook while not doing schoolwork and GPA differ as a function of class standing?

Methods

Participants

All students surveyed were U.S. residents admitted through the regular admissions process at a 4-year, public, primarily residential institution in the Northeastern United States ($N = 3866$). The students were sent a link to a survey hosted on SurveyMonkey.com, a survey-hosting website, through their university-sponsored email accounts. For the students who did not participate immediately, two additional reminders were sent, one week apart. Participants were offered a chance to enter a drawing to win one of 90 $10 Amazon.com gift cards as incentive. A total of 1839 surveys were submitted for an overall response rate of 48%. The data were downloaded as an SPSS file directly from SurveyMonkey, screened for anomalies and analyzed using SPSS Statistics Version 19. Initial screening showed that 65 survey responses were unusable because they were not completed; therefore, the final sample size was 1774.

The overall sample was split into four subsamples corresponding to class standing for the purpose of these analyses. The university uses earned number of credits to categorize students into four categories. Credits are earned by successful completion of courses and a typical course meets three hours per week and earns the student three credits. Students who are enrolled for the first time at a higher education institution and have earned less than 30.0 credits are designated *freshmen*. Students who earned between 30.0 and 59.5 credits are designated *sophomores*. Students earning between 60.0 and 89.5 credits are designated *juniors*. Lastly, students earning 90 or more credits are designated *seniors*.

Instrument/measures

Key independent variables

The survey questions can be found in the Appendix. Facebook usage was evaluated with two survey questions that have been used in a number of previous studies to measure frequency of use and multitasking (Junco, 2012a,b,c, 2013a; Junco & Cotten, 2011, 2012). First, students were asked "On average, about how much time per day do you spend on the following activities?" with a prompt for Facebook. Students used a pull-down menu to select the hours and minutes spent using Facebook. Second, frequency of multitasking with Facebook was evaluated by asking students "How often do you do schoolwork at the same time that you are doing the following activities?" with a prompt for Facebook. The possible choices for multitasking frequencies were worded: *Very Frequently (close to 100% of the time); Somewhat Frequently (75%); Sometimes (50%); Rarely (25%);* and *Never*. For the analyses, these items were coded using a five-point Likert scale with *Never* coded as 1 and *Very Frequently (close to 100% of the time)* coded as 5.

Two variables were created from the Facebook use questions: a measure of how much time students spent multitasking (doing schoolwork at the same time as using Facebook) and a measure of how much non-multitasking time students spent on Facebook. The multitasking variable was created by multiplying the percentage estimate of frequency of multitasking by overall time spent using Facebook. For instance, if a student reported doing schoolwork 50% of the time that they used Facebook and reported spending 100 minutes on the site overall, the value of the multitasking variable would be 50. The non-multitasking variable was calculated by subtracting the multitasking variable from overall time spent using Facebook.

Students were asked to approximate the frequency with which they participated in various activities when they were on Facebook. The 14-item list (see Appendix) of Facebook activities that was developed by Junco (2012b) was used for this study. Junco (2012b) developed the list by asking his Facebook network to identify activities they engage in on the site. There were 39 submissions, which Junco (2012b) compiled into a non-overlapping list of 14 items. The 14 items were shared with two focus groups of undergraduate students for input and were revised based on this input. Lastly, the list of 14 items was posted on Facebook for further comments and a final revision. In the survey, students were asked: "How frequently do you perform the following activities when you are on Facebook? (Note: Choosing "Very Frequently" means that about 100% of the time that you log on to Facebook, you perform that activity)." Facebook activity items were coded using a five-point Likert scale ranging from *Very Frequently (close to 100% of the time)* to *Never*. For this study, *Never* was coded as 1; *Rarely (25%)* as 2; *Sometimes (50%)* as 3; *Somewhat Frequently (75%)* as 4; and *Very 430 Frequently (close to 100% of the time)* as 5.

Overall time spent studying was included in the analyses to control for the possibility that multitasking and time spent studying were related. For instance, it's possible that students who multitask more increase their amount of time studying in order to compensate. To evaluate time spent studying, students were asked: "About how many hours do you spend in a typical 7-day week doing each of the following?" with a prompt for "preparing for class." Hours and minutes for all variables were converted to minutes for this study.

Internet skills were measured using a 27-item scale developed by Hargittai (2005). The original scale was created based on research that compared people's actual online abilities with their responses to survey questions about knowledge of Internet activities (Hargittai, 2005; Hargittai & Hsieh, 2012). Students were asked "How familiar are you with the following computer and Internet-related items?" with prompts for 27 items focusing on Internet activities and technologies. Internet skills items were coded using a five-point Likert scale ranging from *Full* to *None*. For this study, *None* was coded as 1; *Little* was coded as 2; *Some* was coded as 3; *Good* was coded as 4; and *Full* was coded as 5. The Internet skills items have been used in a number of studies and have shown excellent internal consistency across datasets with Cronbach's αs above .90 (Hargittai & Hsieh, 2012). Indeed, data from the current study found the Internet skills items to exhibit excellent internal consistency with a Cronbach's α of .96.

Since high school GPA (HSGPA) is one of the consistently strongest predictors of overall college GPA, it was used as a control variable in these analyses (DeBerard, Speilmans, & Julka, 2004; Geiser & Santelices, 2007; Williford, 2009). In this study, HSGPA was included in the analyses in order to parse out variance in the predictors attributable to pre-existing differences in academic ability and to also place the other predictors in context. Academic ability might be a student background characteristic related to multitasking frequency and to negative outcomes of multitasking (Junco & Cotten, 2011). For example, students with lower academic ability might be more susceptible to the negative academic effects of multitasking. Students gave researchers permission to obtain their actual HSGPA from their records, which were submitted to the university during the admissions process. High school grades were measured on a 4.0 scale ranging from 0 for 'F' to 4.0 for 'A'.

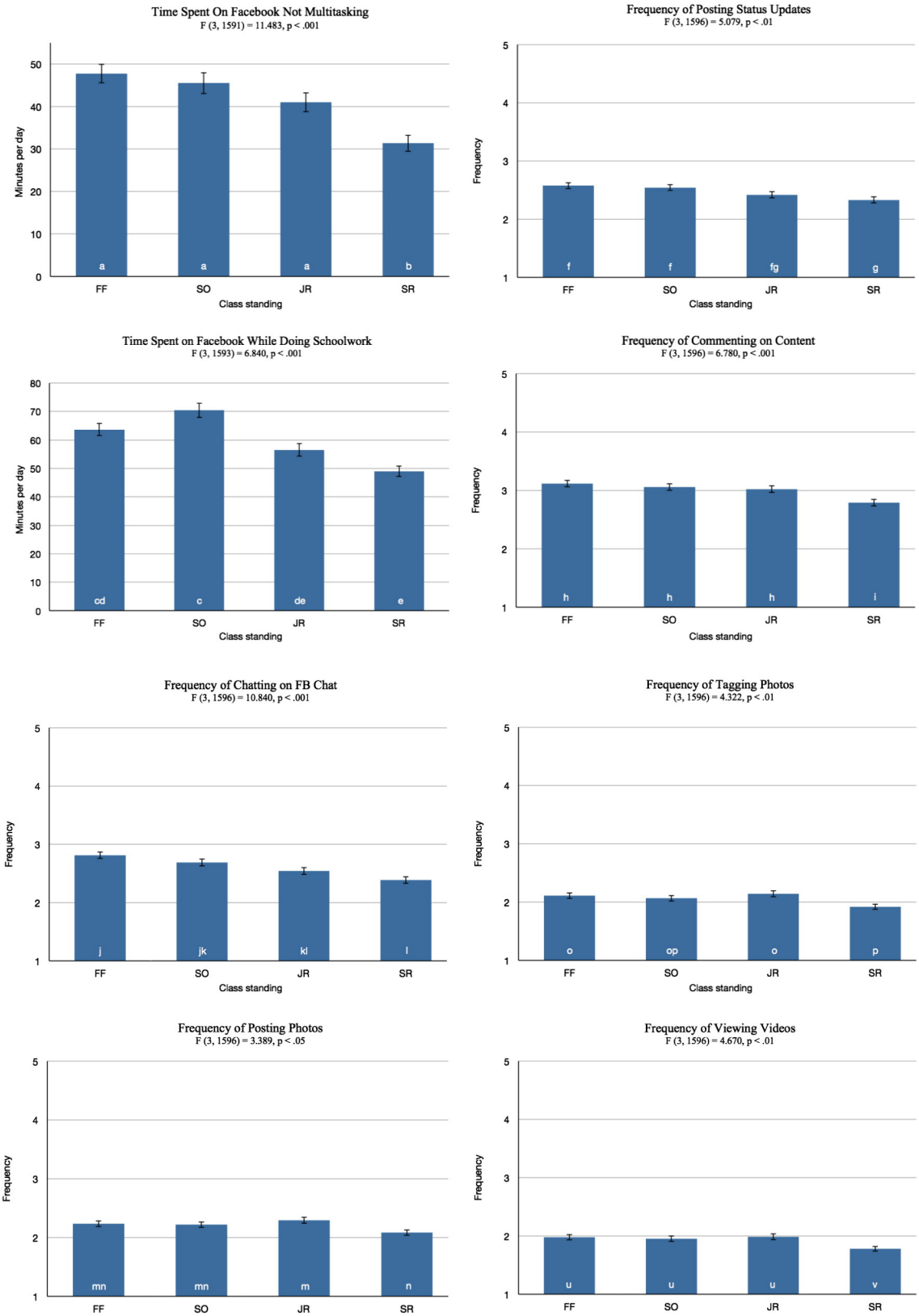

Fig. 1. Results of ANOVAs and Tukey's post-hoc comparisons examining differences in time spent on Facebook, time spent on Facebook while doing schoolwork, and the frequency with which students engaged in Facebook activities by class standing. Only variables with significant differences are shown. Means that do not share subscripts differ at $p < .05$ in the Tukey honestly significant difference comparison. Frequency units are: 5 = "Very Frequently (close to 100% of the time); 4 = "Somewhat Frequently (75%)"; 3 = "Sometimes (50%)"; 2 = "Rarely (25%)"; and 1 = "Never". Error bars are standard errors of the means.

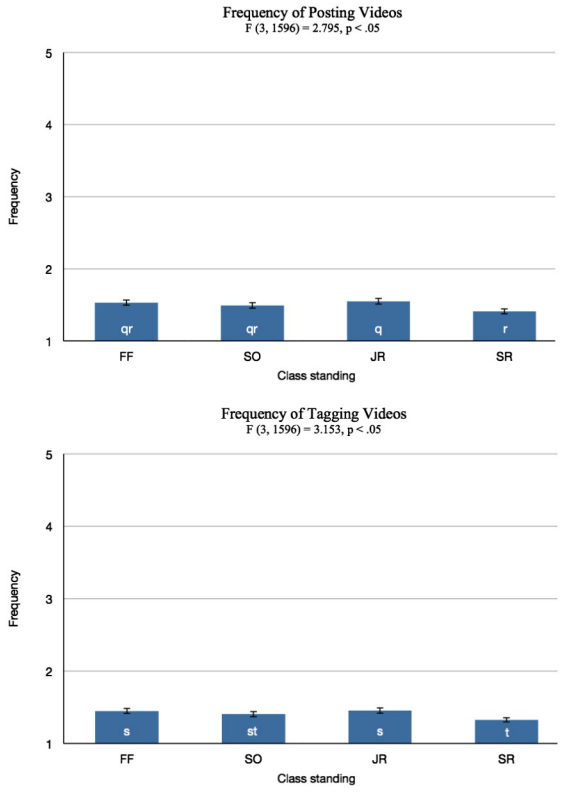

Fig. 1 (*continued*).

Parental education was used as a proxy for socioeconomic status by asking students "What is the highest level of formal education obtained by your parents?" with prompts for "Parent/Guardian 1" and "Parent/Guardian 2." Parental education items were coded using a five-point Likert scale ranging from *Advanced graduate* to *Less than high school degree*. For this study, *Less than high school degree* was coded as 1; *High school degree* was coded as 2; *Some college* was coded as 3; *College graduate (for example: B.A., B.S., B.S.E)* was coded as 4; and *Advanced graduate (for example: master's, professional, J.D., M.B.A, Ph.D., M.D., Ed.D.)* was coded as 5. The higher of the two parental education levels was used for these analyses. Students were also asked to select their gender (male/female) and their ethnicity (African American, Asian American, Hispanic/Latino, Native American, White/Caucasian, or Other).

Outcome measure

Students gave the researcher permission to access their academic records to obtain their actual overall grade point averages (GPAs). Overall GPAs were measured on a 4.0 scale ranging from 0 for 'F' to 4.0 for 'A'.

Analyses

Descriptive statistics were run to illustrate the demographic characteristics of the sample and to describe Facebook use. Analyses of Variance (ANOVA) with Tukey's Honestly Significant Difference (HSD) post-hoc tests were used to evaluate differences in time spent on Facebook between students at different class ranks. To answer research question 3, separate hierarchical (blocked) linear regression analyses were conducted within each class rank to determine which Facebook use variables predicted overall college GPA. The blocks, in order, were: demographic variables (gender, ethnicity and highest parental education level), high school GPA and overall time spent preparing for class, Internet skills, multitasking and non-multitasking time spent on Facebook, and frequency of engaging in the 14 Facebook activities. The blocks were selected for the following reasons: demographic variables were included in their own block because previous research has found the effect of gender, socioeconomic status and/or ethnicity in relation to technology use is significant (Cooper & Weaver, 2003; DiMaggio, Hargittai, Celeste, & Shafer, 2004; Junco, 2013b; Junco, Merson, & Salter, 2010). High school GPA was included as both a control variable and in order to compare other predictors' relative impact on the dependent variables. Overall time spent preparing for class was included to control for the possibility that time spent multitasking was related to time spent studying. Internet skills were included because skills play an important role in how technologies are used and presumably, those with lower levels of Internet skills may use the Internet less and be more prone to using it in problematic ways when they do (Hargittai & Hsieh, 2012; Junco, 2013b; Junco & Cotten, 2011). 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 hierarchical linear regression. To test for homoscedasticity, collinearity and important outliers, collinearity diagnostics and examinations of residuals were performed. The curve estimation procedure of SPSS was used to plot both linear and quadratic functions to examine linearity and found that all variables met the requirements of linearity needed for a hierarchical blocked linear regression. Examination of model fit using the curve estimation procedure indicated there were a number of outliers, which were removed from subsequent analyses. In total, 125 outliers were removed because of extreme scores on one of the variables of interest (high school GPA, reported time spent preparing for class, frequency of Facebook use, etc.) thus bringing the total sample size to 1649 students. Collinearity diagnostics found that the independent variables were not highly correlated, with all tolerance coefficients being greater than 0.20. Examination of the residual plots show that variance of residual error was constant across all values of independents, indicating homoscedasticity.

Results

Descriptive statistics

Sixty-four percent of those who took the survey were female. The mean age of the sample was 21, with a standard deviation of 4. The age of participants ranged from 17–56, though 88% were between 18 and 22 years old. Twenty-eight percent of students in the sample were freshmen, 25% were sophomores, 22% were juniors and 26% were seniors. Highest educational level attained by either parent was as follows: 28% had a high school degree or less, 25% completed some college, 34% were college graduates and 13% had a graduate degree. In terms of race and ethnicity, the sample was overwhelmingly Caucasian, with 91% of students listing that as their race. Additionally, 4% of the sample was African American, 2% were Latino, 1% were Asian American, and 2% identified as "other" (Native Americans were included in "other" because there were only three in the sample). The gender, race, and ethnic breakdown of the sample was similar to that of the overall university population, excepting a slight overrepresentation of women in this sample. The average HSGPA in the sample was 3.24 (*SD* 0.47) and the average overall college GPA was 2.96 (*SD* 0.65). Lastly, students spent an average of 706 minutes (*SD* 508) per week preparing for class.

ANOVAs

Fig. 1 shows the results of ANOVAs and Tukey's post-hoc comparisons examining differences in time spent on Facebook, time spent on Facebook while doing schoolwork, and the frequency with which

students engaged in Facebook activities by class standing. All of the significant omnibus ANOVAs are presented in Fig. 1.

These results show that seniors spent significantly less time on Facebook than students at other class ranks and they spent less time using Facebook while doing schoolwork than freshmen and sophomores. Seniors were also less likely to post status updates, comment on content, use Facebook chat, tag photos, view videos, and tag videos than freshmen. Generally, the pattern of results shows that students interact less with Facebook as they progress in class standing.

Hierarchical linear regression analyses

Tables 1–4 show the results of hierarchical linear regressions examining how demographic variables, HSGPA, Internet skill, Facebook use and Facebook multitasking are related to the overall GPA of freshmen, sophomores, juniors, and seniors. These tables show that both time spent on Facebook and multitasking with Facebook were significantly negatively predictive of GPA for freshmen. Furthermore, only multitasking with Facebook was significantly negatively predictive of GPA for sophomores and juniors but not for seniors. Checking up on friends was positively predictive of GPA for freshmen, but not for students at the other class ranks. Posting status updates was negatively predictive of GPA for sophomores. Posting photos was positively predictive of GPA for juniors, while tagging photos was negatively predictive. Sending private messages and creating and/or RSVPing to events was positively predictive of GPA for seniors while chatting on Facebook chat and watching videos were negatively predictive.

For all students, High School GPA and time spent preparing for class were strong positive predictor of GPA. For freshmen, checking up on friends on Facebook was a stronger positive predictor of GPA than time spent preparing for class. For juniors, posting photos on Facebook was a much stronger positive predictor of GPA than time spent preparing for class; while multitasking with Facebook was equally as strong of a predictor as time spent preparing for class (just in the opposite direction).

Discussion

Research questions

Question 1: How much time do students from different class standings spend using Facebook while doing schoolwork and how much time do they spend on Facebook while they are not doing schoolwork?

As expressed in Fig. 1, freshmen spent 48 minutes per day, sophomores spent 46 minutes per day, juniors spent 41 minutes per day, and seniors spent 31 minutes per day using Facebook while not doing schoolwork. Furthermore, the results showed that seniors spent significantly less time on Facebook than students from other class ranks.

When examining time spent using Facebook while doing schoolwork, freshmen spent 64 minutes per day, sophomores spent 70 minutes per day, juniors spent 57 minutes per day, and seniors spent 49 minutes per day (see Fig. 1). The ANOVA analyses showed that seniors spent significantly less time using Facebook while doing schoolwork than freshmen and sophomores.

Question 2: Which Facebook activities do students engage in as a function of class standing?

As Fig. 1 shows, seniors were less likely to post status updates than freshmen and sophomores, comment on content less than the other class ranks, use Facebook chat less than freshmen and sophomores, post photos less than juniors, tag photos less than freshmen and juniors, and view videos less than all the other class ranks.

Table 1
Hierarchical regression model exploring how demographics, academic variables, Internet skill, Facebook use and Facebook multitasking predict the overall GPA of Freshmen ($n = 437$).

	Block 1 Demographics	Block 2 Academics	Block 3 Internet Skill	Block 4 FB Time	Block 5 FB Activities
Independent variables	β	β	β	β	β
Male	−.041	.034	.020	−.005	−.032
African American	−.030	.035	.028	−.025	−.030
Asian American	−.052	−.027	−.025	−.050	−.036
Other ethnicity	−.026	−.020	−.024	−.047	−.054
Caucasian	.035	.075	.074	.017	.009
Less than high school	−.048	−.041	−.049	−.042	−.043
High school	.008	.037	.043	.034	.045
College graduate	.105	.086	.080	.069	.060
Advanced grad degree	.113*	.092	.095*	.083	.087
High School GPA		.396***	.403***	.387***	.371***
Time preparing for class		.173***	.174***	.148***	.140***
Internet Skills			.106*	.114**	.109*
Facebook Time				−.103*	−.100*
Facebook Multitasking				−.118**	−.130*
Playing games					−.017
Posting status updates					−.024
Sharing links					.049
Private messaging					−.025
Commenting					−.054
Chatting					−.038
Checking up on friends					.191**
Events					.048
Posting photos					−.113
Tagging photos					−.035
Viewing photos					.041
Posting videos					.000
Tagging videos					.013
Viewing videos					−.029
Adjusted R^2	.009	.210	.219	.241	.249
R^2 Change	.030	.200***	.011*	.025***	.031

*$p < .05$. **$p < .01$. ***$p < .001$.

Table 2
Hierarchical regression model exploring how demographics, academic variables, Internet skill, Facebook use and Facebook multitasking predict the overall GPA of Sophomores ($n = 401$).

	Block 1 Demographics	Block 2 Academics	Block 3 Internet Skill	Block 4 FB Time	Block 5 FB Activities
Independent variables	β	β	β	β	β
Male	−.268***	−.114*	−.122**	−.136**	−.119*
African American	−.111	−.070	−.069	−.074	−.056
Asian American	.017	−.001	−.003	−.006	.005
Other ethnicity	−.006	−.016	−.015	−.018	.002
Caucasian	.088	.037	.042	.048	.063
Less than high school	.044	.086	.087	.084	.085
High school	.063	.044	.046	.051	.062
College graduate	.063	−.006	−.004	.003	−.005
Advanced grad degree	.030	−.003	−.001	.009	.021
High School GPA		.422***	.422***	.413***	.405***
Time preparing for class		.195***	.193***	.191***	.191***
Internet Skills			.031	.034	.028
Facebook Time				−.053	−.075
Facebook Multitasking				−.081	−.128*
Playing games					.065
Posting status updates					−.116*
Sharing links					.048
Private messaging					.032
Commenting					.092
Chatting					−.002
Checking up on friends					.110
Events					−.010
Posting photos					.058
Tagging photos					−.037
Viewing photos					−.047
Posting videos					−.167
Tagging videos					.121
Viewing videos					.057
Adjusted R^2	.091	.285	.284	.290	.299
R^2 Change	.111***	.193***	.001	.010	.033

*$p < .05$. **$p < .01$. ***$p < .001$.

Question 3: Do the relation between using Facebook while doing schoolwork and GPA and using Facebook while not doing schoolwork and GPA differ as a function of class standing?

There are differences in the relation between Facebook use and GPA across class standing. As can be seen in Tables 1—4, there is a negative relation between using Facebook while doing schoolwork and GPA and non-multitasking uses of Facebook and GPA for freshmen; however, for sophomores and juniors, there is only a negative relation between using Facebook while doing schoolwork and GPA. Lastly, there is no relation between using Facebook while doing schoolwork and GPA and non-multitasking uses of Facebook and GPA for seniors.

There are also differences in how Facebook activities relate to GPA by class standing. Freshmen's GPAs are positively related to checking up on friends. Posting status updates is negatively related to GPA for sophomores. Posting photos is positively related and tagging photos is negatively related to GPA for juniors. Private messaging and creating and/or RSVPing to events are positively related to senior's GPAs, while chatting and viewing videos are negatively related.

General discussion

The results support the hypothesis that the relation between Facebook use and academic performance changes based on the student's class standing. Specifically, both Facebook use variables were negatively related to freshmen's overall GPAs. Unlike students at the other class ranks *just using* Facebook had a negative relation to freshmen GPA. On the other hand, sophomores and juniors only exhibited a negative relation between multitasking on Facebook and GPA and seniors did not exhibit any relation between either of the Facebook use variables and GPA. These results suggest there is a dynamic at play related to class standing that influences how students interact with Facebook and how such interactions are associated with academic outcomes.

Freshmen were the only group where non-multitasking use of Facebook was negatively related to GPA even though they used Facebook and multitasked with Facebook at the same rate as other students with the exception of seniors. These results are congruent with research on the freshman experience – that entering students have yet to learn important academic skills in order to be successful (Upcraft et al., 2005). In the past, these skills included things like time management, note taking, and organization (Upcraft et al., 2005). However, other studies have shown that students need help with regulating their multitasking and the results of the current study suggest that freshmen might be a group of students that need additional help in this domain (Karpinski et al., 2012; Rouis et al., 2011).

The difference in outcomes between regular use of Facebook between freshmen and students at the other class ranks might be due to their social uses of the site. As previous research has shown, students use Facebook to maintain a network of high school friends and also to build and maintain new friendships on their college campuses (Ellison et al., 2007, 2011; Junco & Mastrodicasa, 2007). Entering college students need to build a new network of friends in order to be both socially and academically successful (Eckles & Stradley, 2011; Pascarella & Terenzini, 2005; Thomas, 2000). It was no surprise then that while there were no differences between groups in the frequency with which they used Facebook to check up on friends, this activity was related to higher GPAs only for freshmen. While all students check up on friends, it is the unique transitional nature of the freshmen experience that requires building social supports. When students check up on friends, they are engaging in the practice of social information seeking which has been shown to be directly related to social capital (Ellison et al., 2011; Pascarella & Terenzini, 2005). When freshmen check up on friends, they are doing so in the context of needing to build new

Table 3
Hierarchical regression model exploring how demographics, academic variables, Internet skill, Facebook use and Facebook multitasking predict the overall GPA of Juniors ($n = 345$).

	Block 1 Demographics	Block 2 Academics	Block 3 Internet Skill	Block 4 FB Time	Block 5 FB Activities
Independent variables	β	β	β	β	β
Male	−.158**	−.102*	−.070	−.094	−.075
African American	−.041	−.089	−.084	−.059	−.061
Asian American	.008	−.047	−.049	−.032	−.022
Other ethnicity	.042	−.009	−.005	−.014	.004
Caucasian	.099	−.034	−.028	−.020	.002
Less than high school	.014	.015	.014	−.001	−.013
High school	−.059	−.020	−.036	−.029	−.036
College graduate	−.039	−.003	−.015	−.031	−.027
Advanced grad degree	−.082	−.038	−.036	−.055	−.046
High School GPA		.331***	.329***	.322***	.315***
Time preparing for class		.154**	.147**	.129**	.143**
Internet Skills			−.105*	−.081	−.089
Facebook Time				−.033	−.023
Facebook Multitasking				−.157**	−.143*
Playing games					.013
Posting status updates					−.077
Sharing links					.074
Private messaging					.090
Commenting					−.116
Chatting					−.031
Checking up on friends					.070
Events					−.060
Posting photos					.241**
Tagging photos					−.192*
Viewing photos					.037
Posting videos					−.098
Tagging videos					.075
Viewing videos					−.018
Adjusted R^2	.026	.151	.159	.179	.196
R^2 Change	.051*	.127***	.010*	.025**	.049

*$p < .05$. **$p < .01$. ***$p < .001$.

relationships, while students in other classes are more focused on maintaining their current relationships. Therefore, when freshmen students build social capital, they are building their social support network necessary to promote a sense of connection to the institution leading to a greater degree of academic commitment and ultimately to improved academic performance (Pascarella & Terenzini, 2005; Tinto, 1993). Indeed, for freshmen, checking up on friends was more strongly related to academic performance than time spent preparing for class.

As has been found in previous research, multitasking with Facebook was negatively related to GPA (Junco, 2012c; Junco & Cotten, 2012; Rosen et al., 2011; Wood et al., 2012). Unlike previous research, the negative relation between multitasking with Facebook and GPA was only found for freshmen, sophomores, and juniors. On the one hand, the results are perplexing given previous research—multitasking with Facebook should result in more negative educational outcomes for all. On the other hand, perhaps there is something unique about being a senior that mitigates the negative effect of multitasking. It might be that seniors have reached a pinnacle of understanding what they need to do in order to be successful, given their earlier college experiences. Perhaps seniors have learned appropriate self-regulation skills through their time in college and apply these skills to their technology use. On the other hand, it is possible that seniors' level of social capital has plateaued and they are less likely to use Facebook for the relationship building and maintenance activities than their younger peers. It is wholly possible that there is something about the act of relationship building and maintenance that increases load demand in a way that affects multitasking with Facebook (Fockert, 2013). It will be important for future research to investigate this dynamic further to elucidate the mechanisms at play in the current findings.

Facebook activities were also differentially related to outcomes by class standing. For example, checking up on friends was positively related to GPA for first-time freshmen. Posting status updates was negatively related to GPA for sophomores. Posting photos was positively related to GPA for juniors, while tagging photos was negatively related. Lastly, sending private messages and creating and/or RSVPing to events was positively related to GPA while chatting and viewing videos were negatively related to GPA for seniors. Previous research has found that posting status updates and chatting on Facebook chat were negatively related to GPA (Junco, 2012a). The pattern of results in the current study suggest that activities involving interpersonal connections (such as checking up on friends and sending private messages) are more positively related to GPA which is congruent with previous research showing that these types of activities are related to student engagement (Junco, 2012b).

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, multitasking, and GPA. While the data show that Facebook use and GPA are negatively related for freshmen, the direction of the effect is difficult to determine. For instance, it could be that freshmen who spend more time on Facebook have lower GPAs; however, it is equally likely that freshmen who have lower GPAs spend more time on Facebook. Further longitudinal and controlled studies are needed in order to determine the mechanisms of causation. For instance, future research might follow entering freshmen students through to graduation evaluating their technology use and social interactions each year. This would allow researchers to further explain how Facebook use and multitasking are related to academic performance, especially as students mature.

A further limitation was related to estimating time spent on Facebook and time spent preparing for class. Specifically, regular time

Table 4
Hierarchical regression model exploring how demographics, academic variables, Internet skill, Facebook use and Facebook multitasking predict the overall GPA of Seniors ($n = 406$).

	Block 1 Demographics	Block 2 Academics	Block 3 Internet Skill	Block 4 FB Time	Block 5 FB Activities
Independent variables	β	β	β	β	β
Male	−.147**	−.075	−.058	−.066	−.058
African American	−.186*	−.165*	−.157*	−.171*	−.159*
Asian American	.043	.030	.040	.035	.047
Other ethnicity	−.112*	−.093	−.090	−.091	−.075
Caucasian	−.012	−.005	.012	−.001	.024
Less than high school	−.024	.013	.009	.010	.024
High school	.039	.064	.063	.066	.079
College graduate	.020	.044	.041	.049	.064
Advanced grad degree	.100	.133**	.141**	.137**	.134**
High School GPA		.372***	.373***	.363***	.332***
Time preparing for class		.191***	.191***	.191***	.209***
Internet Skills			−.083	−.073	−.072
Facebook Time				−.093*	−.084
Facebook Multitasking				−.015	−.007
Playing games					.081
Posting status updates					−.050
Sharing links					.008
Private messaging					.130*
Commenting					−.007
Chatting					−.117*
Checking up on friends					−.058
Events					.117*
Posting photos					−.082
Tagging photos					.084
Viewing photos					.088
Posting videos					.061
Tagging videos					−.054
Viewing videos					−.139*
Adjusted R^2	.057	.231	.236	.241	.262
R^2 Change	.078***	.174***	.006	.009	.046*

*$p < .05$. **$p < .01$. ***$p < .001$.

spent on Facebook and multitasking with Facebook were assessed via self-report. Previous research (Junco, 2012a) has shown that there are differences in outcomes based on how frequency of Facebook use is measured. Newer research by Junco (2013a) has found that self-reported estimates of Facebook usage are considerably overestimated when compared to actual use. Such overestimation can obfuscate the relation between Facebook use and academic performance, although it is unclear in which direction. Therefore, future research will want to combine multiple measures of Facebook frequency of use to arrive at a more complete picture of the relation between Facebook use and outcome variables. Future research might use logging techniques like user-installed monitoring software combined with in-vivo observations and student self-report to triangulate the actual frequency of Facebook use. Such additional research could help identify the most appropriate combination of measurement techniques to get at the true nature of student Facebook use.

Conclusion

The results of this study are congruent with some of the previous literature on student technology use and academic performance. For instance, like previous research (Junco, 2012c; Junco & Cotten, 2012; Rosen et al., 2011; Wood et al., 2012) the current study found a negative relation between multitasking while using Facebook and GPA; however, this relation was only found for freshmen, sophomores, and juniors. These results may be explained by the demands faced by students at each level: freshmen must not only adapt to a new academic environment, but also a social one in order to be successful (Pascarella & Terenzini, 2005; Tinto, 1993). These students use Facebook as a method to engage in and maintain previous relationships as well as to build new ones (Ellison et al., 2007, 2011). Beyond their first year of college, students might use Facebook less for building friendships, which may have been reflected in how different types of usage was related to academic outcomes.

While the data from the current study are suggestive of a developmental process involved in the differences between classes, more research is necessary to elucidate the latent constructs involved in these dynamics. Previous research shows that first-year students must learn to effectively balance academic and social demands in order to be successful (Tinto, 1993; Upcraft et al., 2005). A possible mechanism for future investigation is self-regulation which is the "voluntary control of attentional, emotional, and behavioral impulses in the service of personally valued goals and standards." (Duckworth & Carlson, 2013, p. 209). Indeed, Rouis et al. (2011) found that students with stronger self-regulation skills were more able to control their Facebook use in the service of academic performance. Previous research on multitasking also points to the possible role of self-regulation as a factor that mediates whether students can focus on a single task (Rosen et al., 2011, 2013. Perhaps the research on media multitasking has discovered a tangible measurement of overall self-regulation skills, that is, the ability for youth to withhold their impulses to use social technologies while engaged in academic work.

Previous research has emphasized the importance of building social connections for new college students (Pascarella & Terenzini, 2005; Tinto, 1993; Upcraft et al., 2005). While technological mediation of social connections is an important facet of the experience of today's college students, such mediation might hinder the learning process. The results of the current study suggest that general use of one of the very tools that helps incoming students develop important social bonds (i.e., Facebook) is also negatively related to academic performance. However, engaging in a Facebook activity that helps build these social connections (i.e., checking up on friends) is more strongly related to academic performance in the first year than a purely academic task like time spent preparing for class. In other words, the academic

outcomes of different types of Facebook use reflect the complex interplay between the academic and social demands of the first year of college (Tinto, 1993; Upcraft et al., 2005). Knowing this, higher education professionals can appropriately plan educational interventions to help teach students the importance of regulating Facebook usage. Specifically, they can do this without adopting an abstinence-only perspective, which would serve to alienate students and not allow for the leveraging of the important social affordances of Facebook in support of the first year transition process.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.appdev.2014.11.001.

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