

# A Panel Study on the Effects of Social Media Use and Internet Connectedness on Academic Performance and Social Support

Louis Leung, School of Journalism & Communication, The Chinese University of Hong Kong, Shatin, Hong Kong

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## ABSTRACT

*Using a longitudinal panel study approach, this research examined the effects of social media use and internet connectedness on academic performance and on perceived social support. Results showed that, after controlling demographics and overall grades at Time 1, individual-level change in overall grades over the year that followed was attributable to Facebook, blogs, and online game use but not to internet connectedness. Results suggest that heavy Facebook use has a positive effect on overall grades, while heavy use of blogs and online games leads to grade impairment. In the case of academic competence and perceived social support, individual-level change over the year that followed was only attributable to Facebook use. Implications, limitations, and directions for future research are discussed.*

*Keywords:* Academic Performance, Children and Adolescents, Internet Connectedness, Longitudinal Panel Study, Social Media, Social Support

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## 1. INTRODUCTION

Social media is a group of internet-based applications that build on the technological foundations of Web 2.0, allowing the creation and exchange of user-generated content. Social media takes on many different forms, involving both web-based and mobile technologies, including internet forums, instant messaging (IM), social networking services (SNS), and microblogs, to name but a few. According to the Pew Internet Project, 95% of teens aged 12 to 17 in the U.S. are online, of which 76% use SNS and 77% have cell phones (Madden,

2011). By 2013, there were approximately 1.11 billion unique visitors on Facebook worldwide (Smith, 2013). In China, the Internet population has reached 564 million in 2013, of which 24 percent were between the age of 10 and 19 (China Internet Network Information Center, 2013).

Today, new applications in social media (such as Facebook, IM, blogs, Twitter, YouTube, and online games) are well-accepted as the preferred tools for communication among students. However, despite internet researchers have investigated diverse issues such as internet addiction, cyber bullying, sexting, and internet

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risks and safety on children and adolescents (Leung & Lee, 2012; Livingstone, Haddon, Görzig, & Ólafsson, 2011; Young, 1998), effects of social media on school performance and social relationships have been underexplored. Chen, Shen, & Ma (2012) found that players prefer SNS games to other types of games; Lee, Hsu, & Chang (2013) reported that sociability was the best design strategy for designing educational massively multiplayer online role-playing game (MMORPGs); and Ellison, Steinfield, & Lampe (2007) examined the benefits of Facebook on social capital among college students. Previous research also suggested that some college students' academic performance might be impaired by heavier use of the internet (Jackson, Eye, Witt, Zhao, & Fitzgerald, 2011; Kubey, Lavin, & Barrows, 2001) and impaired academic performance was associated with greater use of synchronous communication applications such as chat rooms and multi-user dungeons (MUDs), as opposed to asynchronous applications such as email and newsgroups. To fill the gap in this line of research, this study examines the impacts of four commonly used social media platforms among adolescents and children (namely Facebook, blogs, IM, and online games) and the degree to which adolescents are connected to the internet on academic performance and social support.

To date, one limitation in this area of research is the lack of longitudinal methods to help establish causal relationships and strengthen the findings of existing cross-sectional reports. This study goes beyond examining the level of social media use and tries to assess the dimensions in internet connectedness (such as years connected, broadband/WiFi access, scope, intensity, goal, and dependency on internet use) that adolescents experienced and the impacts of these dimensions on academic performance and perceived social support. Knowledge of these findings can help parents and educators detect and assess impact of social media among children and adolescents in order to intervene appropriately at an early stage if detrimental use of social media is found.

## 2. LITERATURE REVIEW

### 2.1. Internet Connectedness

To fully capture the many contexts in play, Jung, Qiu, & Kim (2001) devised a multidimensional construct called the internet connectedness index (ICI) based on media system dependency theory (Loges & Jung, 2001). The ICI is a multilevel and contextual approach for assessing the overall relationship between a person and the internet, and it encompasses a number of conventional measures such as time, history, and contexts, and it goes beyond these to capture the scope, goal, intensity, and centrality of the internet in one's life (Jung et al., 2001). As a measure using multiple items, ICI has a greater likelihood of providing deeper contextual meaning than conventional single-item measures with regard to the extent to which we are dependent on, or connected to the internet. The ICI is originally composed of nine factors: *Internet use history*; *Task scope* (reflecting the breadth of tasks in internet use); *Site scope* (involving the types and numbers of places where a person connects to the internet); *Goal scope* (involving six media-system dependency goals by Ball-Rokeach (1985) which include social understanding, self-understanding, action orientation, interaction-orientation, self play, and social play); *Activity scope* (indicating the extent of participation); *Time spent* (showing the intensity of people's connectedness to interactive online activities); *Evaluation of the internet* (assessing the overall positive or negative effect of the internet in one's life); *Personal computer (PC) dependency*; and *Internet dependency*.

Responses from PC and internet dependency capture the subjective centrality of personal computers and the internet in people's daily lives.

With internet connectedness being conceptualized as a multidimensional indicator of a person's overall relationship to the internet, the objective of this study is to describe and analyze the scope, intensity, and goal of internet use, dependency, and the context in which

internet connectedness is related to academic performance and perceived social support.

## 2.2. Academic Performance

Jackson, Eye, Witt, Zhao, & Fitzgerald (2011) surveyed 462 youth, average age 12 years old, and found that greater internet use was associated with better reading skills, especially for those initially low in reading skills. Likewise, video game playing was associated with better visual-spatial skills particularly those with low GPAs. However, Kubey et al. (2001) revealed that heavy internet use for leisure was highly correlated with impaired academic performance, particularly with those using synchronous communication applications like chat rooms and MUDs. Similarly, Chen and Peng (2008) found that light internet users had better academic grades and higher learning satisfaction than heavy users did. Furthermore, in examining how Facebook use is related to academic performance, Junco (2012) revealed that time spent on Facebook is significantly but negatively related to overall GPA. Nevertheless, it is interesting to note that O'Brien (2012) found no significant relationship between Facebook usage patterns and academic performance.

Based on this conflicting literature, it is reasonable to believe that internet in general and with social media in particular—as social media is the media of choice for children and adolescents—may have significant impacts on one's academic performance. Thus, we asked the following research questions:

**RQ<sub>1a</sub>**: What effects, if any, did social media use and internet connectedness have on academic performance at first-wave measures?

**RQ<sub>1b</sub>**: To what extent did social media use and internet connectedness explain individual level change in academic performance over the course of the following year?

## 2.3. Social Support

In a review of early social indicators research, Cobb (1976) defined social support primarily

as information leading the subject to believe that he or she is cared for and loved, that he or she is esteemed and valued, and that he or she belongs to a network of communication and mutual obligation. Other scholars have defined social support as interpersonal transactions involving affect, affirmation, aid, encouragement, and validation of feelings (Hlebec, Manfreda, & Vehovar, 2006).

Past research, however, has generally attempted to measure the *functional components* of social support because functional support is most important and can be of various types, including: (1) *emotional* support, which involves caring, love, and sympathy; (2) *instrumental* support, which provides material aid or behavioral assistance and is referred to by many as tangible support; (3) *information* support, which offers guidance, advice, information, or feedback that can provide a solution to a problem; (4) *affectionate* support, which involves expressions of love and affection; and (5) *social companionship* (also called *positive social interaction*), which involves spending time with others in leisure and recreational activities (Sherbourne & Stewart, 1991). To examine how these functional components of social support can be achieved via computer-mediated environment, Xie (2008) studied the types of social support exchanged within an online community of older Chinese and found that voice chat room is best suited for companionship support while online forum is good for informational support.

With the widespread use of social media among children and adolescents, we expect that the use of different social media and different dimensions of internet connectedness are potent variables that can influence academic performance and the perception of social support. Thus, taking particular care in considering the theoretical dimensions of internet connectedness and social support into this research, the current study investigates how differences in internet connectedness and levels of social media use among adolescents and children influence their school performance and perceived

social support. Therefore, this research posed two additional research questions:

**RQ<sub>2a</sub>**: What effects, if any, did social media use and internet connectedness have on perceived social support at first-wave measures?

**RQ<sub>2b</sub>**: To what extent did social media use and internet connectedness explain individual level change in perceived social support over the course of the following year?

### 3. METHOD

#### 3.1. Sample and Sampling Procedure

To test the relationships over time between the predictor variables (i.e. social media use and internet connectedness) and the criterion variables including academic performance and social support, survey data from a panel sample were collected at two points in time a year apart using a face-to-face questionnaire survey. At Time 1, during the period from December 2008 to February 2009, a random sample of households was sent a postcard invitation from the author with a short description of the study. Respondents were eligible members of randomly generated households (an operation requested by the author and performed by the Census and Statistics Department in Hong Kong). Of the households visited, only 1,002 families had eligible children or adolescents aged 9-19 living in the house of which 718 successfully completed the survey questionnaires (those aged 9-11 were read the questionnaire with the help of the research assistants), which corresponded to a 72% response rate. In January to March of 2010, the survey was re-administered to the respondents from Time 1. However, only 427 participated, yielding a 58% response rate at Time 2.

At Time 1, the sample consisted of 44% male respondents. The mean age of the whole sample was 14.46. The age distribution resembled the Hong Kong 2008 adolescent

population census very closely. Of the 718 respondents, over 88% were high school students or high school graduates. In terms of family income, the mean was at the income bracket of US\$1,928–2,571 per month. At Time 2, the panel sample included 42% male respondents. The mean age of the panel sample was 15.28.

### 3.2. Measures

#### 3.2.1. Internet Connectedness

As more users are now accessing the internet via broadband and 3G mobile phones, these access channels were added to the original theoretical dimensions to better capture the meaning of IC. Thus, the IC construct in this study consisted of three dimensions in seven factors. As shown in Table 1, the *scope and intensity* (1) included number of years connected to internet and was operationalized as the number of years a respondent has accessed the internet at home (“1”=less than a year, “2”=1–2 years, “3”=3–6 years, “4”=7 years or more). Broadband and/or 3G/WiFi *mobile internet access* (2) relates to respondents who have access to the internet at any time, and anywhere at high speed. Respondents were asked, “Do you have broadband and/or 3G/WiFi mobile internet access?” with “0”=no and “1”=yes. *Activity scope* (3) asked respondents, “Besides e-mail, do you do the following (e.g. IM, chat rooms, Facebook, blogs, online news, download music, download movies, online games, shopping, and web surf) on the internet?” with “0”=no, and “1”=yes for each activity. The total number of responses was summed to represent the breadth of participation and was recoded to “1” when none of the activities was chosen, and coded to “2” when one or more activities was chosen. *Activity intensity* (4) was measured by asking respondents, “How often do you use IM, chat rooms, Facebook, blogs, online news, download music, download movies, online games, shopping, and web surf?” and rated each on a 5-point scale with “1”=never and “5”=very often. Data ranged from 10 to 50. To correct the negative skew in the responses, activity

Table 1. Dimensions in Internet Connectedness Index (IC)

Theoretical Dimensions	Mean	SD	Alpha
<b>Scope and Intensity</b>			
Years connected to internet	5.52	2.77	--
Broadband and/or 3G/WiFi mobile internet access	--	--	--
Activity scope	7.39	2.40	.79
Activity intensity	5.47	1.51	.81
<b>Goal Scope</b>	6.40	1.22	.58
<b>Dependence</b>			
PC dependence	5.05	2.72	--
Internet dependence	5.17	2.79	--

intensity was recoded with responses of 10–15 recoded as “1”; 16 to 23 as “2”; 24 to 34 as “3”; and responses of 35 to 50 as “4”. *Goal scope* (5) assessed six goals respondents pursued in online activities by asking, “How important is the internet for you in achieving the following goals?” (e.g., stay on top of events and groups that you care about; express yourself or your opinions; accomplish school work tasks; get advice on how to deal with other people; play or amuse yourself; and make new friends for social reasons). The scale used on each was “1”=not at all important and “5”=very important. Correction for positive skew in responses to goal scope was performed with responses of 6 to 13 recoded to “1”; 14 to 19 recoded as “2”; responses of 20 to 24 recoded as “3”; and responses of 25 to 30 recoded as “4”.

Personal computer *dependency* (6) was measured by asking respondents, “Imagine that you woke up tomorrow to find that the PC has vanished, how much would you miss being able to use the PC?” ranked on a 10-point scale with “1”=wouldn’t miss it at all and “10”=miss it extremely. The distribution of responses to dependency on the PC was skewed such that responses were collapsed into four categories with original responses of 0 to 1 recoded as “1”; 2 to 5 as “2”; 6 to 8 as “3”; and 9 to 10 recoded as “4”. The same question was asked

for *internet dependency*, (7) “Imagine that you woke up tomorrow to find that the internet has vanished, how much would you miss being able to go online?” Again, the distribution of responses to internet dependency was skewed such that responses were collapsed into four categories with responses of 0 to 2 recoded as “1”; 3 to 5 as “2”; 6 to 8 as “3”; and responses of 9 to 10 as “4”.

### 3.2.2. Social Support

To assess social support, a battery of 19 items within four subscales developed by the Rand and Medical Outcome Study (MOS) teams was adopted with slight modifications. The five original dimensions of social support were reduced to four as emotional support and informational support were merged because they were highly correlated and overlapped considerably. As a result, the four subscales were “tangible,” “affection,” “social companionship,” and “emotional or informational” supports. It was recommended that the subscale scores rather than the total score be used. Moreover, items from the tangible support subscale were excluded because tangible support mainly refers to medical or health-related assistance from friends or close relatives rather than being affective or emotionally related. Respondents were asked

how often each of the support items measured in the remaining three dimensions was available to them if needed either online or offline. A 5-point scale was used, where “1”=none of the time and “5”=all of the time. A principal components factor analysis extracted three factors and explained 61.41% of the variance. The three factors were “social companionship” with  $\alpha=.80$ , “affectionate” ( $\alpha=.81$ ), and “emotional and informational” support ( $\alpha=.75$ ).

### 3.2.3. Academic Performance

Two variables were used to assess academic performance. First, each respondent was asked to report, on a 9-point scale in which “1”=55 or lower, “2”=56–60, “3”=61–65, “4”=66–70, “5”=71–75, “6”=76–80, “7”=81–85, “8”=86–90, and “9”=91–100, his or her (a) standing in class, (b) score on the most recent examination in Chinese, (c) in English, and (d) in mathematics. The four scores were summed and averaged to generate a combined score in overall grades with a mean equaling 4.43 (SD = 2.07) and a reliability alpha of .85. To offset the tendency to give socially desirable responses, a second variable, adopted from Harter (1982) and measuring cognitive or *academic competence*, was used. Given seven descriptions of youths, subjects were asked to decide which description he or she most resembled. A 4-point Likert scale was used for the child to decide whether the description was really true for him or her. Sample description items included: finishes school work quickly; is just as smart as others; understands what is read; and likes school and doing well. Scores were summed and then averaged resulting in a mean of 2.77 (SD = .5) and a reliability alpha of .79.

### 3.2.4. Social Media Use

Adolescents and children were asked how much time *last week* they spent online on four most popular internet activities, namely use of IM, Facebook, blogs, and online games using a 7-point scale where “1”=never, “2”=less than an hour, “3”=about an hour, “4”=more than one but less than two hours, “5”=two to less than

three hours, “6”=three to less than four hours, and “7”=four or more hours.

### 3.2.5. Offline Social Activities

In addition to demographics, social media use, and internet connectedness, we sought to add more understanding of the dynamics involved by analyzing offline activities as another key indicator in examining influences on academic performance and perception of social support. Thus, respondents were asked to estimate (1) how many minutes the previous day they had spent face-to-face with (a) family/relative, (b) friends, and (c) schoolmates engaging in a conversation that lasted three minutes or more (casual “hi and bye” interactions were not included) and (2) how often they (a) went to movies, (b) went on picnics or to BBQs, (c) went window shopping, and (d) went to parties or karaoke in their leisure time. Each item was measured on a 5-point Likert scale with “1”=not often and “5”=very often. Responses to these items were combined to yield a composite score reflecting the level of social activities respondents engaged in offline.

### 3.2.6. Demographics

Social demographic variables were included as control variables: gender (male=1), age, education, and monthly family income.

## 4. RESULTS

### 4.1. Predicting Academic Performance

Many of the variables showed significant variances one year apart. Academic performance (with overall grades in particular) significantly declined in the following year at Time 2, while perceived social support did not show any significant change. Similarly, the intensity of Facebook and IM use also showed significant upsurge, but there was a small drop in online games use the following year. With the exception of broadband or 3G/WiFi mobile access to

internet, all dimensions in internet connectedness had notable increases one year later.

Our first analysis examined in terms of overall grades and academic competence what influenced academic performance at Time 1 of the study. The first and third columns of Table 2 present the results among the full first-wave sample in 2009. One finding that stands out is the significant and negative effect from online games ( $\beta = -.14, p < .01$ ) and use of IM ( $\beta = -.11, p < .05$ ) and the significant and positive effect from activity intensity ( $\beta = .19, p < .01$ ) and broadband/3G/WiFi internet access ( $\beta = .11, p < .05$ ) on overall grades. This suggests that the less time children and adolescents spent in online games and IM and the more frequently they access the internet for different activities via broadband or 3G/WiFi mobile, the higher the overall grades they will achieve. Another interesting finding is the consistent effect of goal scope and PC dependence on both overall grades and academic competence. For the two dependent variables, the statistically significant effect was positive for goal scope but negative for PC dependency at the .01 level or better. The coefficients for other social media use (such as Facebook and blogs) and other dimensions of internet connectedness did not attain statistical significance for any of the dependent variables at Time 1. Demographically, the younger the subjects were, the better the grades they received.

A key question one would ask is what influenced individual-level changes in overall grades over this period? In other words, among which respondents were the declines most pronounced? To answer this question, we estimated static-score models for each second-wave dependent variable. Each model included a lagged, dependent variable (the first wave value of the dependent variable), the demographics, the second-wave social media use measures, and change in social media use, along with the seven internet connectedness factors. According to Finkel (1995), static score models of this sort are generally superior as models of change to simple "unconditional" models of change scores. The coefficients reported in Table 2 can also be interpreted as the cause or developmental

trends of the independent variables on changes in academic performance, controlling for the respondent's initial level of overall grades and academic competence.

As shown in Table 2, after controlling for prior level of academic performance, we found significant effects of Facebook use on changes in academic performance. Put another way, we can say that children and adolescents who were heavy Facebook users scored better in both overall grades and academic competence than light Facebook users, controlling for initial levels of academic performance. By contrast, we also found significant effects of other social media use (especially blogs and online games) on changes in overall grades, but not in academic competence; however, the effects were negative. In other words, we can say that children and adolescents who were light users of blogs and online games yielded higher overall grades than heavy blog and online game users, controlling for initial levels of overall grades. However, the coefficients for all dimensions of internet connectedness did not attain statistical significance for any of the dependent variables. The adjusted  $R^2$  also suggests that Model 2 is better than Model 3 given the significant increase in 1% to 3% of variance explained in Model 2 while no improvement was recorded in Model 3.

In sum, we found that social media (with online games and IM in particular) and internet connectedness (especially goal scope and PC dependency) were significant factors that influenced both overall grades and academic competence at Time 1. One year later, our results clearly show evidence that social media use, with Facebook in particular, along with blogs and online games use, explained individual-level changes in academic performance. Such results suggest that the impact of Facebook use was positive while that of blogs and online games were negative.

## 4.2. Predicting Social Support

We followed a similar approach in analyzing what affected social support at Time 1 of the

Table 2. Summary of multiple hierarchical regression analyses of influences on academic performance

Predictors at Time 1	Academic Performance							
	Overall Grades				Academic Competence			
	2009		2010		2009		2010	
	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$
Step 1:		.13**		.40***		.00		.27***
T1 scores of criterion	--		.64***		--		.52***	
Gender (male=1)	-.03		-.07		-.02		-.04	
Age	-.36***		-.03		-.03		-.01	
Education	.02		.07		.10		.05	
Step 2: Social Media Use <sup>a</sup>		.03*		.03*		.00		.01*
IM	-.11*		-.06		-.07		-.04	
Facebook	.05		.20***		-.01		.12*	
Blogs	.10		-.11*		.03		-.03	
Online games	-.14**		-.09*		.06		-.04	
Changes in IM use	--		.02		--		.04	
Changes in Facebook use	--		-.05		--		.06	
Changes in blog use	--		.04		--		.03	
Changes in online game use	--		-.03		--		.03	
Step 3: Internet Connectedness <sup>a</sup>		.06***		.00		.06***		.00
Years connected to internet	.05		.04		.01		.01	
Broadband/3G/WiFi internet access	.11*		.04		.06		.05	
Activity scope	.01		-.05		.00		.03	
Activity intensity	.19**		-.11		.03		.03	
Goal scope	.21***		-.04		.15**		.01	
PC dependence	-.15**		-.01		-.25***		.01	
Internet dependence	.06		-.01		.02		.04	
$R^2$		.23		.44		.06		.28
Adjusted $R^2$		.22		.43		.06		.28
$F$		15.21***		61.70***		11.53***		65.81***
$n$		718		427		718		427

Note: \*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ ;  $N=427$ ; Adjusted  $R^2$  and  $F$  values concern the final regression model.

<sup>a</sup>Social media use predictors and internet connectedness predictors in the regression analyses were from T1 for 2009 and from T2 for 2010.

study and what shaped individual-level changes in it. Our basic model for social support differed from our model for academic performance, however, in that it included offline activities as another predictor as much of the social support

children and adolescents receive comes from offline activities such as face-to-face communication with family, friends, and schoolmates, while going to movies, picnics or BBQs, we believe, also have significant effects on perceived social

support. The first column of Table 3 presents the results of our model for social-companionship in the first-wave. Similarly, the third column presents results for affectionate and the fifth column for emotional/information social support also at Time 1. As the table shows, in the coefficients for the first wave, among all social media use, blogs attained statistical significance and were all positive in relating to the three dimensions of social support. Facebook was also significant but only for social companionship. With respect to internet connectedness, results show that higher the activity intensity did contribute significantly and positively to social support while PC dependency was linked negatively to only social companionship and affectionate dimensions. As expected, offline social activities also showed significant influence on all three dimensions of social support.

To examine what influenced individual-level changes in social support, we estimated another static score model. This one predicted social support one year later at Time 2 as a function of social support at Time 1, demographic and social media use variables at Time 2, changes in social media use, dimensions in internet connectedness, and offline activities. The results (Table 3, second column) indicate that gender ( $\beta = -.10, p < .05$ ), Facebook use ( $\beta = .10, p < .05$ ) and offline activities ( $\beta = .14, p < .01$ ) had significant effects on changes in the social companionship dimension of social support. In other words, controlling for initial levels of social companionship, female regular users of Facebook and female respondents who had regular offline activities were more likely than non-users of Facebook and non-participants of offline activities to exhibit an increase in social companionship over this period. Likewise, after controlling for initial levels of affectionate and emotional/information social support, as indicated in separate regression equations (Table 3, fourth and sixth column), female regular users of Facebook were more likely than non-users to report an increase in affectionate and emotional/information social support over the course of the following year. None of the other variables in the model were significant predic-

tors of change in social support, controlling for other factors. As indicated by  $R^2$  change, Model 2 significantly improved on the prior model for all three dependent measures of social support except for social companionship. For social companionship, despite a small and significant increase in  $R^2$  of 1% in Model 2, Model 4 is a better model with 2% significant improvement on prior model was recorded.

In sum, we found that use of blogs, being active on the internet and in offline social activities, and being less reliant on personal computers did shape social support, together with Facebook use especially for social companionship at the initial stage of the study at Time 1 in 2009. One year later, Facebook use was significantly associated with the increase in all dimensions of perceived social support. Moreover, we found evidence that Facebook use explained individual-level changes in perceived social support that occurred in the year later after Facebook became increasingly popular in 2010.

## 5. CONCLUSION AND DISCUSSIONS

Several key findings emerged from our analyses. First, built on studies by Loges & Jung (2001) and Jung et al. (2001), which linked the IC concept to the digital divide and inequality, this study reported the development of a modified measure of IC. The new measure employs a comparable taxonomy of theoretical dimensions conceptualizing the importance of the internet in one's life in a broader context, one that goes beyond the traditional dichotomous adoption, and time- and need-based measures. We believe that the new measure is more complete because it includes additional indicators such as internet access via broadband and 3G/WiFi mobile phones, as the internet is becoming increasingly ubiquitous. Another improvement is that the considered scope of internet activity is much wider and includes the trendy internet applications of recent years, such as the use of IM, SNSs (e.g. Facebook and blogs), online

Table 3. Summary of Multiple Hierarchical Regression Analyses of Influences on Social Support

Predictors at Time 1	Social Support											
	Social Companionship						Affectionate					
	2009		2010		2009		2010		2009		2010	
Step 1:	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$
T1 scores of criterion	--	.02*	.44***	.20***	--	.04*	.48***	.28***	--	.03*	.38***	.16***
Gender (male=1)	-.16**		-.10*		-.21***		-.15***		-.14**		-.10*	
Age	.09		.05		.07		.03		.12*		.01	
Education	.08		.06		.06		.03		-.08		.04	
Step 2: Social Media Use <sup>a</sup>		.07***		.01*		.04*		.01*		.04*		.01*
IM	.09		.06		.10		.05		.04		.06	
Facebook use	.12*		.10*		.11		.09*		.08		.11*	
Blogs	.20***		.09		.22***		.09		.23***		.05	
Online games	-.00		-.04		.02		-.02		.00		-.01	
Changes in IM use	--		.06		--		.06		--		.06	
Changes in Facebook use	--		-.00		--		.00		--		-.04	
Changes in blog use	--		.02		--		.01		--		.05	
Changes in online game use	--		.05		--		.07		--		.01	
Step 3: Internet Connectedness <sup>a</sup>		.03*		.00		.04**		.00		.05**		.00
Years connected to internet	.03		.08		.03		.07		.05		.02	
Broadband/3G/WiFi internet access	.07		-.01		-.00		.01		.04		.05	
Activity scope	-.12		-.04		-.10		-.02		-.11		-.06	
Activity intensity	.23**		.00		.26***		.01		.25***		.01	
Goal scope	.07		-.03		.02		-.03		-.04		-.03	
PC dependence	-.16**		.04		-.14**		.05		-.08		-.01	
Internet dependence	-.07		-.01		-.07		.00		-.07		.02	

Predictors at Time 1	Social Support											
	Social Companionship						Affectionate					
	2009		2010		2009		2010		2009		2010	
	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$
Step 4: Offline Social Activities <sup>a</sup>	.17**	.02*	.14**	.02*	.14**	.01*	.10	.00	.15*	.01*	.04	.00
$R^2$		.16		.24		.15		.29		.12		.18
Adjusted $R^2$		.14		.23		.13		.29		.11		.17
$F$		11.03***		27.06***		12.28***		49.61***		10.18***		25.45***
$n$		718		427		718		427		718		427

Note: \*\*\*  $p < .001$ ; \*\*  $p < .01$ ; \*  $p < .05$ ;  $N=427$ ; Adjusted  $R^2$  and  $F$  values concern the final regression model.  
<sup>a</sup>Social media use, internet connectedness, and offline social activities predictors in the regression analyses were from T1 for 2009 and from T2 for 2010.

news, and music and video downloads, in addition to BBS, MUDs/MOOs/MUSHs, and USENET, as used in previous studies.

Second, our results showed that IM and online games, but not Facebook or blogs, were associated with poorer overall grades at Time 1 of the study. The negative impacts of IM and online games are understandable as numerous studies have demonstrated the addictive tendency of online games and the synchronous nature of IM, which may have a damaging consequence on academic performance (Kubey et al., 2001). At the same time, having broadband or 3G/WiFi mobile internet access and being active internet users for diverse goals had positive effects on school grades at Time 1. This may be explained in that the more children and adolescents are connected to the internet for a wide range of activities (e.g. IM, chat rooms, online news, download music, download movies, shopping, and web surf) with high speed broadband or 3G/WiFi mobile internet access, which facilitates diverse goals to be achieved (such as seeking information; expressing opinions; accomplishing school work tasks; making new friends; and getting advice and entertainment), the better the school grades they will receive. Such findings are reasonable as they clearly illustrate the educational and social values of the internet and that teachers and policymakers should adopt and incorporate web-based teaching tools and social media tools to foster learning. However, excessive or maladaptive use of the internet will also bring negative consequences (Young, 1998).

Third, results also showed that, after controlling gender, age, education, and overall grades at Time 1, individual-level changes in overall grades over the year that followed were attributable to Facebook, blogs, and online game use but not to any dimensions of internet connectedness and explained an additional 3% of the variance. This suggests that heavy Facebook use has a positive effect on individual changes in overall grades while heavy use of blogs and online games will lead to poorer school grades over the course of the following year. One possible explanation is that adolescents and children

may have established communities based on shared interests in a Facebook group to share ideas, build friendships, and to help each other on homework assignments. However, instead of helping, heavy use of blogs and online games may have taken time away from studies, resulting in grade impairment. Another interesting finding is that online games re-enforced the negative effect on school grades at Time 1, while the negative effect of IM attenuated at Time 2. This suggests that the popularity of Facebook in 2010 might have taken over IM and played a much stronger role in influencing academic performance together with negative influence of online games and blogs. It is worth mentioning that such finding is contrary to Junco's (2012) study which revealed that time spent on Facebook is significantly but negatively related to overall GPA. Such contradictory result may be due to the age and cultural differences with Junco's study focused on 17-56 in the U.S. while this study investigated children and adolescents aged 8-19 in Hong Kong. Furthermore, children aged 8-13, are still very much being supervised by parents in their daily use of the internet and social media. As a result, the positive effect of Facebook on academic performance may also be partly due to parental mediation.

Fourth, in the case of academic competence, greater goal scope of internet use and lower reliance on PC significantly and positively shaped academic competence at Time 1. On the other hand, individual-level changes over the year that followed were only attributable to Facebook use. This indicates that heavy use of Facebook may have facilitated academic and social activities such as helping each other in finishing school work, sharing and supporting each other, and encouraging each other to do well in school in a specially opened peer support group in Facebook. Such findings further strengthen previous studies and confirm the positive influence of Facebook on overall grades (Madge, Meek, Wellens, & Hooley, 2009).

Fifth, as for perceived social support, significant influence of the use of blogs on all three dimensions of social support were found at Time 1 of the study. With the exception of the effect

of Facebook on social companionship, IM and online games had no effects on social support. This indicates that frequent use of blogs appears to facilitate children and adolescents in developing relationships and obtaining affectionate, and emotional and informational support from others. However, excessive use of blogs (as shown in Table 2) may have a negative result on school grades. Therefore, while it is important for students to use blogs as a space for social interaction such as interpersonal transactions involving affect, affirmation, aid, encouragement, and validation of feelings (Hlebec et al., 2006), over use of blogs may bring negative consequences. Meanwhile, results also showed that heavy use of various internet functions (especially for IM, chat rooms, online news, download music, download movies, shopping, and web surfing) and low reliance on personal computers had a positive effect on all dimensions of social support. This indicates that, in addition to blogs and Facebook, frequent use of other internet services for social interaction (e.g. for relationship maintenance such as chat and instant messaging; for news seeking; and for entertainment such as music, movies, and games) also significantly helped shape positive perceptions of social support they received at Time 1.

Sixth, it is interesting to note that individual-level changes in all dimensions of social support over the year that followed were also attributable to the use of Facebook. This again suggests that using Facebook in their peer support study group may have provided a space for both children and adolescents to listen to each other, comfort and support each other, understand and solve others' problems, share private worries, show love and affection, and to obtain guidance, advice, information, feedback, and suggestions to deal with problems.

However, we did not find any evidence that internet connectedness explained individual level changes in social support over the course of the following year; those who had a longer history, larger activity and goal scopes, and more reliance on the use of the internet using broadband or 3G/WiFi mobile were no more or less

likely to exhibit higher or lower social support than those who did not. It is also important to note that Facebook was the overwhelming and the sole factor after controlling for demographics and the criterion variables that shaped social support in that period. The result is consistent with the significant effect found in influencing academic performance. This suggests that Facebook can facilitate emotional support, which involves caring and love; information support, which offers guidance and advice that can provide a solution to a problem; affectionate support, which involves expressions of love and affection; and social companionship support, which involves spending time with others in leisure and recreational activities (Sherbourne & Steward, 1991; Xie, 2008). With such findings, educators and policymakers should take note that Facebook can be the platform of choice for adolescents and children to connect, socialize, share information, and help and learn from each other. Future research using longitudinal data should also explore whether these findings are supported in western cultures.

## 6. LIMITATIONS AND SUGGESTIONS FOR FUTURE RESEARCH

This longitudinal panel study offers some important findings about the impacts of social media (positively from Facebook and negatively from blogs and online games) on academic performance and on all three dimensions of social support (especially the positive effects of Facebook use). However, some important limitations must be addressed. First, our analyses control for the most likely sources of spurious relationships between social media use and academic performance and social support. Nonetheless, we cannot be certain of the direction of these effects. In addition, we cannot link our respondents to the specific content, activities, and goals when they engaged in social media; thus, we can only speculate about the reasons behind the differences in the effect of social media over time and across different platforms. We

do, however, see our account as plausible and consistent with the available evidence. Future studies should address specific functions, goals, and content they engaged in on different social media for an accurate account of the effects of the activities on academic performance and perceived social support.

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