HIGH SCHOOL STUDENTS' ACADEMIC PERFORMANCE AND INTERNET USAGE

Wesley Austin, University of Louisiana at Lafayette
Michael W. Totaro, University of Louisiana at Lafayette

ABSTRACT

Considerable controversy surrounds the effects technologies such as the Internet have on human capital accumulation. As with most media, the Internet and related services are capable of delivering enriched learning experiences. However, there are large potential costs to using the Internet and its concomitant services, which may result in degradation of high school students' scholastic performance. In this study, we explore two related questions. First, does Internet usage harm the grades of high school students? Second, to what degree does the intensity of Internet usage affect grades? We utilize data from the 2005 National Survey on Drug Use and Health (NSDUH), which measures educational outcomes, internet use and a host of other correlates. Probit results indicate that excessive Internet use lowers the probability of earning top grades while more moderate use has a positive impact on the probability.

INTRODUCTION

Several reasons might lead technology to assist or impair human capital attainment by students. Youths may employ the Internet in educational matters such as writing papers, searches for answers to questions and communicating with classmates on homework. However, time spent in activities where "surfing the net" occurs could substitute away from time allocated to reading, studying and completing homework. This may hurt academic performance in the short term, which might also diminish the ability or incentive to continue schooling over the longer term.

Within the past decade, the Internet and WWW use have increased substantially – for example, according to Pew Internet & American Life Project Surveys, the percentage of U. S. online users has increased from 40-45% in March 2000 to nearly 80% in April 2009 (Pew Internet & American Life Project Surveys, 2009). Recent expansion of adolescent use of the Internet is the result of an ongoing shift in adolescents' daily behavior patterns. The majority of adolescents from a sample in one study compared their online behaviors to the phenomenon of placing telephone calls, which are typically mundane, the purposes for which are both social and nonsocial (Gross, 2004). Hence, adolescents' Internet use occurs without much thought or consideration – it has become, in effect, just a normal daily activity.

Why is the potential impact of Internet use on educational outcomes relevant for the discipline of economics? Human capital accumulation bears directly and heavily on earning potential (see Grossman, 1972 and Mincer, 1974) and it is widely accepted that strong and statistically significant relationships link individual health and human capital formation. Moreover, the impact of educational policies and factors that affect learning continues to generate widespread public policy concern. Thus, for economists and policy makers, gauging the relationship that technology use has on educational outcomes is worthy of study.

MOTIVATION

Computer access and use among adolescents and other ages have grown considerably over the past decade (Louge, 2006). In fact, more than 80% of U.S. adolescents between the ages of 12 and 17 use the Internet, with roughly half going online daily (Lenhart et al., 2005). The significance of Internet use by children and adolescents has even spawned a new field of inquiry in developmental psychology (Greenfield and Yan, 2006). With the likelihood that Internet usage by adolescents will continue to increase over time, concerns about the impact on high school students' academic performance should be researched. Stakeholders – parents, teachers, administrators, and the students themselves – would benefit from knowing more about the digital environment within which learning occurs. Regardless of whether academic performance is positively or negatively impacted by Internet use, a better understanding and greater awareness about such issues might facilitate changes in pedagogy by educators, as well as learning on the part of students and the support they receive from their parents.

In a conceptual context, we tacitly assume that students utilize the Internet for both academic and non-academic purposes, with the most *intense* users (which is described in the Data section) spending the most time in non-academic pursuits (e.g. Facebook, downloading music). And our general modeling framework is one of optimization, where there are both educational benefits and costs to the Internet, and where the primary benefit of Internet use is increased human capital accumulation as evidenced by higher grades. At a basic level, Internet use denotes a certain amount of technical savvy which emanates from a student actually learning a new skill – this alone can translate into higher grades. Benefits derived from Internet use usually come about at significant costs, including deployment of the required infrastructure for providing Internet access to students (which this study does not directly address) as well as monetary and time costs devoted to the Internet that detract from educational achievement (see Angrist and Lavy, 2002).

The central issue is to determine what, if any, level of Internet use raises or lowers grades. This entails a quintessential marginal benefit/ marginal cost analysis. This article begins the process by examining quasi-defined levels of Internet utilization (where *more venues of use* in a defined time period is assumed to equate to *more money and time devoted to use*) and the resulting impact on student grades.

LITERATURE OVERVIEW

The controversy over whether technology actually improves student learning is one that stirs debate and motivates research. The articles reported in the economics literature have been limited both in quantity and scope with methods and results varying across studies. The literature has focused primarily on the impact of technologies in general on student learning; few studies have examined the direct link between educational outcomes such as GPA and Internet use.

Gratton-Lavoie and Stanley (2009) compare undergraduate students who opted to enroll in online microeconomics classes against those who opted for the traditional in-class course. Results show a higher average score on exams for students enrolled in online classes. However, after accounting for selection bias, results indicate that age positively affects students' average exam scores, with the online teaching mode having a very small effect on average exam scores. Kubey et al. (2001) uses a small survey of 572 students at a public university and finds that heavy Internet use is highly correlated with poor academic performance.

Angrist and Lavy (2002) argue that most studies covering enhancements of learning through technology focus on qualitative factors, such as participant perceptions. Thus, an empirical approach is undertaken which compares outcomes between students who supplement learning with computer aides against those students who do not. Their results show that increased educational use of computers seems to have little or no effect on students' test scores. Ordinary least squares regression estimates demonstrate no relationship between computer-aided instruction and academic achievement, with the exception of a negative effect on eight-grade mathematics scores.

Ball et al. (2006) examine the effect of employing wireless handheld technology by students on academic performance in undergraduate principles of economics courses by way of a controlled experiment. One group of students (experimental group) were equipped with wireless handheld devices that allows interactive participation with standard economics games, multiple choice tests, and communication with the instructor during class time. The second group (control group) was not given the devices. Course content, assignments, exams, and so on, were identical between both groups. Results show that students in the experimental group earned final grades that were an average of 3.2 points higher than did the students in the control group.

Anstine and Skidmore (2005) assess whether MBA students in online economics classes learn as much of the material (measured by average exam scores) as did their counterparts in the traditional economics classes. Specifically, a small sample of MBA students was given the option to enroll in either an online or traditional class. Accounting for sample selection bias, regression analysis proffers that students in the online classes did not learn as much, suggesting that the online learning environment is less effective than the traditional classroom environment.

Jackson et al. (2006) studies the impact of home Internet use on academic performance of 140 low-income children between December 2000 and June 2002. The degree of Internet use is calculated using four measures: minutes per day spent online, logins per day, number of domains visited per day, and number of emails sent per day. Academic performance of participants was measured by GPA and standardized test scores on the Michigan Educational Assessment Program (MEAP). Results suggest that children with greater Internet use had higher GPAs and higher MEAP scores. However, the higher MEAP scores were only in the reading portion, with Internet use having no effect on the mathematics portion of the MEAP test.

It is worth noting that at least one study examined adolescents' activities while online (Hunley, Evans, Delgado-Hachey, Krise, Rich, Schell, 2005). Employing a logbook approach whereby students documented their time for a seven-day period, Hunley et al. (2005) found that at least 50% of the students (N = 101) logged the following activities while online (hours per week indicated in parenthesis): visiting web sites (1.27), playing games (4.43), reading the news (0.73), researching information (1.22), and emailing (1.13). Fewer than 50% of the students spent time chatting (2.12), word processing (2.13), shopping (1.60), and "other" (2.00).

Many studies have limited sample sizes and education-related variables. In contrast, our analysis employs a much larger sample size of students for which there is substantially greater information on demographics and household characteristics. Moreover, the number of variables available in our dataset is large and generally exceeds the number of variables found in the datasets in the above studies.

DATA

Since its inception in 1979, the National Survey on Drug Use and Health (NSDUH), sponsored by the Substance Abuse and Mental Health Services Administration (SAMHSA), is administered annually to approximately 55,000 civilian, non-institutionalized individuals age 12 and over, chosen so that the application of sample weights produces a nationally representative sample with approximately equal numbers of respondents from the 12–17, 18–25, and 26 and over age groups.

Variables on Internet use are collected and compiled by SAMHSA administrators only for the 2005 survey; hence these are the data we analyze. Our sample consists of 12,184 enrolled high school students. Data from the NSDUH allow for both breadth and depth of coverage on the topic. Breadth comes from the ability to study aspects of educational outcomes using data from an elaborate questionnaire administered to 12–17 year olds on a wide array of youth experiences. An assortment of variables are observed, therefore, that have the potential to serve as predictors for grades in the proposed model. Depth is provided by variables on race, gender, family income, family composition, religion and health.

A potentially problematic attribute of the data is non-random measurement error emanating from the self-reported nature of responses. However, studies on the quality of self-reported academic variables data suggest that such reporting bias should be minimal. Cassady (2001) finds that self-reported GPA values are "remarkably similar to official records" and therefore are "highly reliable" and "sufficiently adequate for research use." Hunley et al. (2005)

address concerns about self-reported survey data by way of demonstration of the reliability of survey data as “appropriate” for measuring accurately adolescents’ Internet use. Specifically, students provided estimates of their Internet use, and then logged their actual daily Internet use for a one week period. Comparisons between estimated Internet use and actual use showed reliability of the self-reported estimates. Their conclusion is that researchers should feel confident about self-reported survey data pertaining to Internet use.

RESEARCH METHOD AND EMPIRICAL SPECIFICATION

Consider the following equation, in which Grades is a function of exogenous factors with Internet usage of prime importance,

$$\text{Grades} = \beta_0 + \beta_1 IU + X\beta_2 + \varepsilon$$

In the above equation, which applies to individual NSDUH respondents (with the corresponding observation-level subscript suppressed), IU represents venues of Internet usage in the past 30 days. Vector X represents a set of other exogenous variables that conceivably affect grades. The β’s are parameters to be estimated and ε is the error term.

Grades

We investigate effects on grades by analyzing the probability the student receives an ‘A’ or ‘B’ average or an average of ‘D’ or below. Grades is measured using a 1-4 scale with ‘4’ representing A+, A, A- ; ‘3’ representing B+, B, B-; ‘2’ representing C+, C, C- and ‘1’ representing D or below.

Internet Usage

When the survey is administered, respondents are queried on venues of Internet utilization in the past 30 days. We categorize Internet users in three forms: Level 1; Level 2; and Level 3. For individuals in Level 1, the Internet was utilized at home, at school, at a friend’s house, at a café with Internet access, over a cell phone and *some other place* – this variable is “open” and does not have specific options. For those in Level 2, the Internet was utilized at home and at school. For those in Level 3, the Internet was utilized only at school. We term those in Level 1 as *intense* Internet users; those in Level 2 as *moderate* users; and those in Level 3 as *light* users. For *light* usage, Internet access is subject to time constraints (i.e. hours of operation for schools), whereas for *intense* and *moderate* usage, there is virtual 24 hour access. To avoid the “dummy variable trap” in the regressions, those that did not use the Internet (*no* use) in the past 30 days is the omitted category and is used as the category of comparison.

Explanatory Variables

Several variables from the NSDUH data are considered explanatory in equation (1): age indicators are included for whether the student is 14, 15, 16 or 17 years old with age 13 as the omitted category to avoid the "dummy variable trap." Binary indicators are included for whether the mother or father resides in the household, for whether parents assisted the student with homework always or sometimes in the past 12 months, with "never" as the omitted category, and for whether the student is currently classified as a sophomore or junior/ senior, with "freshman" as the omitted category. We also include a binary variable for school type (public or private). Potential endogeneity (stemming from students' "self-selecting" into certain learning environments by choosing to attend certain schools) should be mitigated in that location of high school attendance is largely determined by parental preferences in occupation, living conditions, as well as other correlates.

To control for the possibility that a student subscribes to a "work hard-play hard" ethos and therefore heavily utilizes the Internet yet maintains high grades, a binary indicator is incorporated for a student that heavily uses the Internet and also states that school work is important/ meaningful, and is thus more likely to have good grades. We term this a "high motivation" student.

Family income is measured in four categories: $10,000-$19,999; $20,000-$49,999; $50,000-$74,999; and $75,000 or greater, with $10,000-$19,999 as the omitted category. A measure for the number of times the student moved in the past year is incorporated as is a binary indicator for gender. For race, indicators are specified for Caucasians, African Americans and Asians, with non-white Hispanics as the omitted category. Further, student physical health is measured as follows: great health, good health and fair health with "poor health" as the omitted category. A factor for religiosity is also included given that this may proxy for increased academic discipline. For this factor, a binary variable is created and coded as '0' if religion does not influence decisions and '1' if it does. Religiosity has been linked to educational outcomes (Wolaver, 2002).

EMPIRICAL FINDINGS

Table 1 presents select summary statistics. *Intense* Internet use is 0.047 and *moderate* Internet use is 0.491 while *light* use is lower with a mean of 0.350 – all indicating abundant exposure to the Internet. Approximately eight percent of students attend private schools. Fathers are less likely to be present in the household than are mothers and the proportion of parents that always help with homework is also quite high (0.54). Caucasians comprise approximately 63 percent of the sample, African Americans about 14 percent, while non-white Hispanics and Asians account for about 15 percent and three percent, respectively. About one third of students report being in excellent health, with 41 percent reporting good health, and a large proportion (0.651) state that religion influences decision making.

Table 1. Descriptive Statistics (n=12,184)		
Variable	**Mean**	**Standard Deviation**
Probability of an 'A' or 'B' grade	0.684	0.465
Probability of a 'D' or lower grade	0.070	0.256
Intense Internet Use (past 30 days)	0.047	0.213
Moderate Internet Use (past 30 days)	0.491	0.499
Light Internet Use (past 30 days)	0.350	0.407
No Internet Use (past 30 days)	0.112	0.315
High Motivation Student: heavy internet use/ positive school attitude	0.713	0.452
Mother in household	0.918	0.275
Father in household	0.732	0.443
Respondent is female	0.501	0.500
Attending private school	0.082	0.274
Age of student (13 years old)	0.134	0.340
Age of student (14 years old)	0.215	0.410
Age of student (15 years old)	0.228	0.420
Age of student (16 years old)	0.222	0.415
Age of student (17 years old)	0.192	0.394
Race (Caucasion)	0.631	0.483
Race (African American)	0.136	0.342
Race (Asian)	0.030	0.170
Race (non-white Hispanic)	0.152	0.359
Sophomore	0.220	0.414
Junior or Senior	0.324	0.468
Family income (less than $20,000)	0.180	0.344
Family income ($20,000-$49,999)	0.345	0.475
Family income ($50,000-$74,999)	0.202	0.402
Family income ($75,000 or more)	0.286	0.452
number of times moved (past year)	0.322	0.696
Parents help with homework (always)	0.547	0.498
Parents help with homework (sometimes)	0.230	0.421
Student health status (great)	0.331	0.471
Student health status (good)	0.418	0.493
Student health status (fair)	0.213	0.410
Religion influences decisions	0.651	0.477

The Effects of Internet Use on the Probability of Obtaining an 'A' or 'B'

As shown in Table 2, *intense* Internet use is significant and lowers the probability of earning an 'A' or 'B' versus lower grades; *light* Internet use also lowers the probability while *moderate* use elevates the probability of an 'A'/ 'B'. The Log Pseudolikelihood is -6707.84. *Intense* Internet use reduces the probability of achieving an 'A'/ 'B' by 0.03 – for students that are *intense* Internet users, the probability of having an 'A'/ 'B' average is undercut by approximately 5 percent compared to students who did not use the Internet at all in the past 30 days (to which, for parsimony, we refer to as '*no* use' for the remainder of the section). If a student reports *moderate* usage, the probability of having an 'A'/ 'B' increases by 0.08 compared to *no* use – *moderate* users have a roughly 12 percent increased probability of earning this average compared to *no* use. *Light* internet users have about a 6 percent lower probability of earning an 'A'/ 'B' versus *no* use.

The negative effects associated with *intense* Internet utilization may indicate that this level of usage actually impairs the learning process (perhaps by lowering attention span) which, in turn, reduces the capability of the student to earn top grades. Also, students using the Internet at a friend's house or café may be distracted by non-academic conversations even when using the Internet for academic purposes. In addition, *intense* use may translate into less time spent on and homework and studying, compared to *no* use; hence, grades are lower for those in the *intense* use category versus *no* use.

Interestingly, *light* users have a diminished probability of an 'A'/ 'B' versus *no* use. This may provide evidence that when students have Internet access only at school, that time is utilized "surfing the net" for recreational purposes (e.g. Facebook), which is time subtracted from studying; therefore, grades are actually lower for those in the *light* use category compared to *no* use. Overall, *moderate* use (which includes home use as a major component) has the most positive impact on grades, which could indicate that home Internet use by students is more focused on academic pursuits compared to other venues.

As stated in our Motivation section, there is an opportunity cost involved in using the Internet, which includes reduced study time and possibly increased devotion of the students' monetary resources to Internet services that detracts from the prospect of receiving an 'A'/ 'B' average. These results imply that those costs are salient. This is an interesting contrast to the study done by Jackson et al. (2006), which (as discussed earlier) found that adolescents who used the Internet more had higher grade point averages. An additional contrast to our results and the results of the Jackson et al. (2006) study are the results of Hunley et al. (2005), which did not show a significant relationship between time spent on the computer at home and grades.

Table 2. Probit estimates for the probability of an 'A' or 'B'		
(n=12,184)		
Log Pseudolikelihood=-6707.84		
Explanatory variables	Coefficient	Robust Standard Error
Intense Internet use	-0.034***	(0.021)
Moderate Internet use	0.082*	(0.014)
Light Internet use	-0.039*	(0.014)
High Motivation Student	0.116*	(0.011)
Mother in household	0.057*	(0.016)
Father in household	0.012	(0.011)
Respondent is female	0.145*	(0.008)
school type (private)	0.082*	(0.015)
Age of student (14 years old)	-0.047*	(0.016)
Age of student (15 years old)	-0.127*	(0.019)
Age of student (16 years old)	-0.193*	(0.024)
Age of student (17 years old)	-0.191*	(0.028)
Race (Caucasian)	0.089*	(0.020)
Race (African American)	-0.011	(0.022)
Race (Asian)	0.198*	(0.018)
Sophomore	0.073*	(0.014)
Junior or Senior	0.137*	(0.018)
Family income ($20,000-$49,999)	0.006	(0.013)
Family income ($50,000-$74,999)	0.037**	(0.015)
Family income ($74,999 and over)	0.097*	(0.014)
number of times moved (past year)	-0.035*	(0.006)
Parents help with homework (sometimes)	0.021**	(0.006)
Parents help with homework (always)	0.057*	(0.008)
Student health status (great)	0.217*	(0.019)
Student health status (good)	0.164*	(0.021)
Student health status (fair)	0.062*	(0.022)
Religion influences decisions	0.064*	(0.009)
*statistically significant at 1%		
**statistically significant at 5%		
***statistically significant at 10%		

The Effects of Internet Use on the Probability of a 'D' or Lower Average

Table 3 presents the regression estimates for the probability the respondent has a 'D' or lower grade versus other grades. The Log Pseudolikelihood is -6707.84. *Intense* Internet use elevates the probability of achieving a 'D' or lower grade by almost 0.02. If a student reports *moderate* usage, the probability of having a 'D' or lower average falls by 0.03 compared to *no* use, but rises by 0.01 for *light* use (compared to *no* use). *Intense* users have a higher probability of a 'D' or lower grade (about 25 percent), while *moderate* users have a decreased probability (approximately 28 percent) of having this average, compared to students who report *no* use. *Light* users have a roughly 13 percent increased probability of a 'D' or lower average compared to *no* use.

The estimated effect for *intense* use is rather large, even accounting for the fact that the outcome incorporates grades of 'D' and 'F'. Again, there may be large opportunity costs associated with such rigorous Internet use which undermines academic achievement. Thus, grades are lower and higher failure rates may account for some of the largeness. Moreover, *moderate* users fare better academically compared to *no* use: *moderate* users have a decreased probability of earning a 'D' or less versus those students' that report *no* Internet use. For *light* users, the probability of earning 'D' or lower is higher compared to *no* use, again potentially indicating that students who only have Internet access at school spend this time in recreational use and hence suffer lower grades as study time falls.

The Effects of Other Explanatory Variables on Grade Probabilities

Many of the other explanatory variables have a significant impact on grades. Interestingly, "High Motivation" students have a greater probability (0.12) of earning an 'A'/ 'B' average but the probability of earning a 'D' or lower is reduced by 0.06. The presence of mothers in the households generally has a favorable impact on 'A'/ 'B' grades, while the presence of fathers is not significant. However, parental involvement does have profound effects as assisting with homework raises student grades. For example, if a parent *always* helps with homework, the probability of an 'A'/ 'B' rises by approximately 0.06; the probability of 'D' or lower falls by 0.02.

Those that attend private schools have a 12 percent greater probability of earning an 'A'/ 'B' and a 27 percent lower probability of having a 'D' or lower average. In addition, Caucasians and Asians have higher probabilities of achieving an 'A'/ 'B' average versus African Americans, while females enjoy a higher probability of 'A'/ 'B' and versus males. Higher levels of income are also significant in some instances. Students in families earning $20,000-$49,999 and $50,000-$74,000 a year have a greater probability of obtaining an 'A'/ 'B' average (0.037 and 0.197 respectively) and lower probability of having a 'D' or less (-0.008 and -0.017 respectively), compared to families earning $10,000-$19,999.

Table 3. Probit estimates for the probability of a 'D' or lower		
(n=12,184)		
Log Pseudolikelihood=-2697.80		
Explanatory variables	Coefficient	Robust Standard Error
Intense Internet use	0.018**	(0.010)
Moderate Internet use	-0.021*	(0.005)
Light Internet use	0.009***	(0.005)
High Motivation Student	-0.053*	(0.006)
Mother in household	-0.007	(0.007)
Father in household	0.001	(0.004)
Respondent is female	-0.025*	(0.003)
school type (private)	-0.019*	(0.006)
Age of student (14 years old)	0.011	(0.007)
Age of student (15 years old)	0.033*	(0.009)
Age of student (16 years old)	0.065*	(0.014)
Age of student (17 years old)	0.053*	(0.016)
Race (Caucasian)	-0.012	(0.008)
Race (African American)	-0.013***	(0.007)
Race (Asian)	-0.037*	(0.006)
Sophomore	-0.002*	(0.005)
Junior or Senior	-0.048*	(0.006)
Family income ($20,000-$49,999)	0.005	(0.005)
Family income ($50,000-$74,999)	-0.008	(0.006)
Family income ($74,999 and over)	-0.017*	(0.006)
number of times moved (past year)	0.011*	(0.002)
Parents help with homework (sometimes)	-0.001*	(0.002)
Parents help with homework (always)	-0.020*	(0.003)
Student health status (great)	-0.057*	(0.006)
Student health status (good)	-0.051*	(0.007)
Student health status (fair)	-0.021*	(0.006)
Religion influences decisions	-0.025*	(0.004)
*statistically significant at 1%		
**statistically significant at 5%		
***statistically significant at 10%		

As students advance in age, the probability of having an 'A'/ 'B' mildly decreases and the probability of a 'D' or lower increases. Of course, this may indicate an increasing opportunity cost involved in studying and in other educational activities as students learn to drive, enjoy more personal freedom and possibly rebel against parents. The effects are opposite for class standing where students that are juniors/ seniors have enhanced probabilities of earning an 'A'/ 'B' and lower probabilities of earning a 'D' or less. This could imply that at least some students study more in an effort to "drive-up" GPA's for approaching college entrance.

In keeping with broader literatures on human capital, students that are in better health also earn higher grades (higher probability of 'A'/ 'B'; lower probability of 'D' or less), while those that relocate more often have lower 'A'/ 'B' probabilities and higher 'D' and below probabilities. In addition, religiosity impacts grades: students who state religious beliefs influence decisions have a 0.064 greater probability of having an average 'A'/ 'B' average and a 0.025 diminished probability of having a 'D' or less than 'D' average. For the most part, our results demonstrate that the number of venues of Internet use have an impact on the academic achievement of high school students even after controlling for a host of other factors.

CONCLUDING REMARKS

For this study, there is evidence that the grades of high school students are lowered when additional venues of Internet access are utilized. Specifically, when all venues of Internet use are exhausted, which we refer to as *intense* use, grades are lower when compared to students that report *no* Internet use. Moreover, students that only use the Internet at school, which we term *light* use, also suffer from lower grades compared to those that did not utilize the Internet. Conversely, students that used the Internet at school *and* at home, which we term *moderate* use, enjoy higher grades versus those that did not use the Internet. Our model supports a hypothesis of "optimal" Internet use. Results indicate that grades are higher when students undertake *moderate* Internet use; however, grades decline when students are below or surpass a certain threshold (i.e. optimum). Potentially large opportunity costs of Internet use (in the possible form of detractions from time spend studying and engaging in other activities that enhance grades) may be present for *intense* and *light* Internet users.

The results provide useful information to high school administrators, teachers, counselors, parents, and students, when they consider implications for use of the Internet in an educational setting. Moreover, university administrators and faculty will find the results helpful, since many high school graduates continue their education by way of college and university studies. From a policy perspective, high school administrators may wish to consider guidelines that curtail non-academic Internet use in schools.

Our data did not explicitly outline whether students' Internet use was for academic or social purposes; therefore, future research that incorporates this data would provide more information. In addition, the costs of deploying the required infrastructure needed to provide

Internet access to students would prove useful in continued analyses of the benefits and costs of the Internet.

REFERENCES

Angrist, J. & V. Lavy (2002). New evidence on classroom computers and pupil learning. *The Economic Journal*, *112*(482), 735-765.

Anstine, J. & M. Skidmore (2005). A small sample study of traditional and online courses with sample selection adjustment. *Journal of Economic Education*, *36*(2), 107-127.

Ball, S. B., C. Eckel, & R. Christian (2006). Technology improves learning in large principles of economics classes: Using our WITS. *The American Economic Review*, *96* (2): 442-446.

Cassady, J.C. (2001). Self-reported gpa and sat: A methodological note. *Practical Assessment, Research & Evaluation, 7*(12). Retrieved December 13, 2010, from http://PAREonline.net/getvn.asp?v=7&n=12.

Gratton-Lavoie, C. & D. Stanley (2009). Teaching and learning principles of microeconomics online: An empirical assessment. *Journal of Economic Education, 40*(1), 3-25.

Greenfield, P. & Z. Yan (2006). Children, adolescents, and the internet: A new field of inquiry in developmental psychology. *Developmental Psychology, 42*(3), 633-649.

Gross, E. (2004). Adolescent internet use: What we expect, what teens report. *Applied Developmental Psychology*, *25*(6), 633-649.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy, 80*(2), 223-255.

Hunley, S.A., J. H. Evans, M. Delgado-Hachey, J. Krise, T. Rich, & C. Schell (2005). Adolescent computer use and academic achievement. *Adolescence*, *40*(158), 307-318.

Jackson, L.A., A. von Eye, F.A. Biocca, G. Barbatsis, Y. Zhao & H.E. Fitzgerald (2006). Does home internet use influence the academic performance of low-income children? *Developmental Psychology, 42*(3), 429-435.

Kubey, R.W., M.J. Lavin & J.R. Barrows (2001). Internet use and collegiate academic performance decrements: Early findings. *Journal of Communication, 51*(2), 366-382.

Lenhart, A., M. Madden & P. Hitlin (2005). Teens and technology: Youth are leading the transition to a fully wired and mobile station. *Pew Internet & American Life Project*, 27 July 2005. Retrieved June 10, 2009, from http://www.pewinternet.org/~/media//Files/Reports/2005/PIP_Teens_Tech_July2005web.pdf.pdf.

Louge, N. (2006). Adolescents and the internet. *ACT for Youth Center of Excellence*. Retrieved June 15, 2009, from http://www.actforyouth.net/documents/Oct061.pdf.

Mincer, J. (1974). *Schooling, experience and earnings.* New York: National Bureau of Economic Research.

Pew Internet & American Life Project Surveys (2009). *Internet adoption*. Retrieved August 4, 2009, from http://www.pewinternet.org/Trend-Data/Internet-Adoption.aspx.

Wolaver, A M. (2002). Effects of heavy drinking in college on study effort, grade point average, and major choice. *Contemporary Economic Policy*, *20*(4), 415–428.