

A STUDY ON THE EFFECT OF INTERNET USE AND SOCIAL CAPITAL ON THE ACADEMIC PERFORMANCE*

BAE YOUNG
Soongsil University

This study examined the condition of Internet use and social capital, as well as its effects on teenager's academic performance. We analyzed survey data of 361 high school students. The study findings suggest that the Internet expands its reach to teenagers' school life. First, students are more reliant on the Internet to access to information that is involved in school life as well as entertainment. Second, teenagers tend to manage their social capital through the Internet. Third, the result of regression analysis indicates that Internet use time irrespective of purposes is less likely to influence academic performance, while in-degree centrality and ego-network efficiency are more likely to exert positive influence on academic performance.

Key Words: *Internet, Social Capital, Academic Performance, Network Analysis.*

INTRODUCTION

The Internet exerts increasingly more influence on our everyday life. Internet-based activities expand their reach beyond the economic and social fields. A growing number of Internet users spend their leisure time in the cyber community. Recent studies indicate that age is a more important variable than schooling or income in determining Internet use (The Korea Economic Daily, 2004). Consequently, it is not surprising that 94.8% of teenagers use the Internet (Ministry of Information and Communication, 2005). This propensity suggests that teenagers may consider the cyber space as a real rather than virtual space.

The Internet has a Janus face. On the one hand, it gives every facility for us. More importantly, it is usually considered as a window of opportunity for the alienated. On the other hand, anonymity in the cyber space makes people insensible to abuse on the Internet. It brings about all sort of antisocial actions, infringement of intellectual property right, and leakage of private information. In spite of the two-edged effect, it is clear that we can not do without the Internet. Especially unlike the previous generation not exposed to the cyber culture before socialization, the influence of the cyber culture on the teenagers' socialization is rapidly growing. In this sense, the

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social activity of teenagers in the cyber community is a barometer indicating the future image of our society as well as teenagers themselves.

Recently the conversation on relational theorization introduced a new perspective on which we are heavily reliant to discuss social matters. For example, deviant subculture theory was a dominant theoretical perspective to analyze teenager's deviation. As deviant subculture makes teenagers insensible to deviation behaviors, selective friendship with those involved in the crime is considered as a key variable to predict deviation. Many criminologists attempted to identify teenagers who were more likely to be involved in deviation. They used individual attributes such as age, sex, education, parent's education and income to construct an predictive model (Smelser, 1981: 86-89). However, the core to which the deviant subculture theory attempted to assess was not individual attributes but the selective choice between friends. We can suggest a better alternative than previous studies which were based on individual attributes by constructing a theory on the basis of measuring actual relations between teenagers. For this purpose, relational theorization, which became available due to remarkable development in the field of social science, must be the only relevant research approach.

The concept of social capital plays a critical role in applying Relational theorization in research. Coleman (1990) defines social capital as a substance defined by function that has two common features. Social capital helps transition from macro to micro perspective and contributes individual actors to achieve a specific aim. Just like other capitals, lack of social capital will cause difficulty in reaching the objective. In this sense, social capital is productive. Social capital, unlike physical and human capital, is not fungible. However, we can find a substitute for it in certain environment. The difference between social capital and others is that social capital is embedded not only in social relations between a pair of actors but also in social network consisting of a number of actors (Portes, 1998).

Physical capital was a dominant capital in the industrial society based on mass production and mass consumption. As this society attached weight to producing more with less cost and time, it was a pending issue in the age of physical capital to increase productivity by investing more and more on machines and facilities. However, the mass production system failed to satisfy various tastes of consumers. Subsequently, it was replaced with small[quantity]-batch production. As productivity of the new system was more reliant on new and innovative ideas, human capital became dominant. In the age of human capital, it became a pending issue to develop individual capability available for new production system (Lin, 2001). However, the

advent of the information society requires us more than human capital. Under the new environment supported by well established communication infrastructures, the importance of exchange, cooperation and communication is gradually growing. The social capital substitutes for human capital that was considered as a critical resource to produce value-added goods. Now we are faced with the age of social capital that has no parallel in history. We can not stress more the importance of social capital.

This study looks into the effect of Internet use and social capital on teenagers' academic performance which is the matter of primary concern of teenagers. First, this study examines teenagers' Internet use and overall understanding of the Internet. Then, we assess their effects on students' academic achievements, which are measured by school records.

PREVIOUS STUDIES

Internet use and social capital

The rapid development of information technology has caused significant changes in the social network pattern. There are two contending perspectives on the orientation of these changes. One is that, as individuals spend more time on the Internet, it necessarily reduces available time for people to interact with others. As a result, Internet use results in decreasing intensity of social interaction in the off-line world. The other is that, as the Internet expands opportunities for people to interact with others, it contributes to increases in not only intensity but also the scope of social interaction (Howard et al., 2001; Nie, 2001; Orleans and Laney, 2000; Pruijt, 2002 Wellman et al., 2001).

Orlean and Laney (2000: 57) identified these opposite perspectives with the zero-sum and non zero-sum game perspective. The former assumes that the use of media and technology is more likely to reduce the opportunity for users to engage in existing personal relations, while the latter assumes that the media and technology are more likely to expand the opportunity to engage in personal relations by increasing the demand of social interaction. From this perspective, activities in the virtual and real space are not contradictory but complementary in producing and strengthening social capital. Internet use is assumed to make up for a weak point of social capital embedded in the real space by increasing communication. A complicated network emerges from Internet interaction. This network has attributes such as cooperation, voluntariness, and sharing information. These attributes are exactly coincides with the characteristics of social capital.¹

Analyzing the U.S. national survey from 1995 to 2000, Katz (Katz et al., 2001) reported positive effects of Internet use on social interaction. First, the Internet use increased or at least did not decrease participation in democratic affairs and social activities. Second, there were significant relations between Internet use and the frequency of telephone conversation. It indicated that information technology contributed to increased communication irrespective of dispersed distribution of participants. Third, more importantly, the on-line activities did not decrease the amount of time which users spent with family and friends. This propensity was not different between long-term and short-term Internet user groups. As a result, they concluded that social interaction will be expanded with the help of the Internet under the environment in which the performance of digital device is improving so as to clear away obstacles for interaction.

Some other studies focused on how individual propensity and attitude toward social interaction affect Internet use. Nie (2001) argued that the frequency of Internet use was positively related to sociality. According to this study, those who joined in social activities more actively had stronger inclination to use the Internet, and subsequently the frequency of Internet use had negative relations with the frequency of communication and social contact with others.

Several researchers also expressed their anxiety about the negative effect of Internet use (Nie and Erbring, 2000; Shenk, 1997). They suggested that social interaction in cyber space costed no less than off-line interactions. Online interaction necessarily imposes burden on social actor's everyday life. Blanchard and Horan (1998) reported that only participation in on-line activities involved in the Parents Teacher Association (PTA) of an elementary school and in an information board of local residents increased the frequency of face-to-face interactions. According to this study, the regionally based Internet activity is more likely to increase off-line interactions than spatially dispersed Internet activities.

Tonn and others (Tonn, Zambrano, and Moore, 2001) refuted this result. They argued that such activities did not show any direct effect on social capital. As we become more reliant on the Internet to exchange information, we tend to neglect face-to-face interactions. Consequently, Internet use exerts negative effects on increasing and maintaining face-to-face interactions.

Yoon (200) stresses the importance of a peer group and its effect on Internet use through a study on Korean teenagers. According to his result,

¹ For this reason, internet has the merit and demerit of social capital simultaneously (Pruijt, 2002).

Internet use pattern and degree are closely related to the peer group. Teenagers consider a friend network and peer group culture embedded in the network as a significant others for them. Consequently, their network exerts a great influence on Internet use. Also, family is no less important than friends in personal relations. Yang (2003) examined how Internet use affected the degree of satisfaction in personal relations and social activities. The result reports that Internet use time was positively related to contact time with friends, but negatively associated with frequency of conversation with parents. In other words, Internet use contributes to increases in social capital with friends, but impedes to keep good relations with family. It is not easy to conclude whether Internet use contributes to social relations or functions as an obstruction.² Such question would be not only difficult to answer but also fruitless. We should rather look into the context and the medium through which on-line social relations are formed. As teenagers are more reliant on the Internet for various activities in everyday life, Internet use sways the quality of individual life by transforming off-line social interactions. In this sense, Internet use is closely related with interpersonal trust and maintaining social collectivity. Therefore, Internet use of teenagers is an important issue that deserves much research attention.

Internet use and academic performance

Previous studies on Internet use of teenagers have been inclined to concentrate on Internet addiction (Na, 2004; Kim, 2004; Kim, 2002; Lim et al., 2004; Son, 2003). These studies have suggested alternatives by investigating conditions of Internet addiction. However, their efforts had some limitations in that they considered individual social-psycho attributes as a cause and an effect simultaneously. Also, their focus on the negative aspect of Internet use hampered to develop further discussion. The implication drawn from these studies is that we can launch an effective policy for Internet addiction by analyzing the school environment that is an important factor for students

² Calling an attention on this contention, Castells (2001) insists that both sides divided into two opposite camps are exposed to fallacy because of three limitations simultaneously. First, as most researches were carried out before expansion of internet use, the results of several empirical observation on the early internet users are not relevant to generalize the effect of internet use. Second, this contention is initiated in the condition that reliable empirical researches on actual internet use are not accumulated. Third, irrelevant generalizations strongly restricted to develop further discussions. One side still sticks to positive side that is assumed to encourages cooperation and dedication on the basis of collectiveness. The other side also don't give up the negative image of netizen emerging from alienation and anonymity.

using the Internet.

Seo (2004a) approached Internet use from a different perspective. Unlike previous studies that stressed the effect of family, he analyzed, through a survey, how the collective attribute of school environment affects Internet use. The result indicates that the negative effect of Internet use is confined within excessive Internet users rather than exerts influence on student Internet users in general. In a school where the percentage of white-collar parents was higher, students tended to have stronger motivation and self-regulation than in other schools. As a result, socio-economic attributes of students in a school tend to influence students' Internet use time and Internet use proficiency. His another research indicates that 'Internet centered pattern', which is more reliant on Internet use, would show relatively lower school records (Seo, 2004b: 66-68). The Internet is a neutral, 'value-free' technology and medium. However, the school, an environmental variable and motivation, an individual variable sways the degree of Internet use as well as its outcome.

Jeong (2005) examined the difference in academic performance of elementary school students by Internet use. This empirical research reports that Internet addiction is significantly and negatively related to students' academic performance as well as emotional attributes. He suggested that negative aspects of Internet use can be avoided by promoting students' self-regulation capability with help from teachers and parents.

As the public interest in 'e-learning' is growing rapidly, its effects on education can not be ignored. In this sense, it is meaningful to examine how the Internet use pattern and Internet contents affect academic performance of students. If we can find negative or positive relations between various types of Internet contents, that will provide us with a sound basis to control or encourage specific Internet contents.

Social capital and academic performance

A study on the mutual effect between social capital and academic performance is in the early stage compared to other topics. However, this research topic has been considered to have greater possibility of producing excellence results. Coleman's research (Coleman, 1988) is often cited as a seminal work on this topic. His study reports that the type and existence of social capital among students and parents affect academic performance. He uses the proportion of voluntary withdrawal as a variable to measure academic performance. The proportion of withdrawal was strikingly lower for students involved in a social acquaintance network with parents, which had

higher density and higher degree of closure.

Ahn (2004) applied this aspect to a Korean case study to analyze family social capital and its effects on children's academic performance. The influence index of family background on achievement was 1.7%. However, that of relationship between parents and children was 10.8%. The result indicates that, unlike previous studies on social achievement, social capital between parents and children is a more important variable than family background for predicting academic performance. Some other network analysis on social capital between classmates supports this result.

Chang (2000) examined how social capital affected social interaction between high school students and academic performance through a case study of a high school located in Seoul. Students in disadvantageous relations were more likely to have lower scores. The maximum difference score was 30 points. The result suggests an important implication about problems of private education as well as the Korean university entrance examination system. The private education is an attempt to increase children's human capital by investing parents' physical capital on the outer edge of public education. Implication drawn from the result is that we had better to invest in public education, because we can improve students' academic achievement by promoting students' social capital within the frame of public education. This result partially supports an argument that social network is closely related with teenagers' everyday life as well as their social achievement. This argument seems to tell its own tale, because education is a social phenomenon with two dimensions. The endogenous attribute of education assumes interaction, and the outcome of education can be different depending on social environment to which individuals belong. social needs to promote social interaction and social environment urge us to investigate the influence of social capital embedded in social relations.

METHODOLOGY

Survey method

This study was conducted using a face-to-face, self-administered survey with a sample of students from four high schools in Seoul, Korea. Two of these schools are located in the Kangnam area and others in the Kangbuk area. The survey questionnaires were distributed in 12 classes after selecting one class from every grade in all four schools. Three-hundred-eighty-three of 420 students responded resulting in a return rate of 91%. After eliminating 22 unusable questionnaires, 361 cases were used for data analysis.

TABLE 1. CONSTRUCTION OF KEY VARIABLES

Variable	Items	Questions	Remark
Internet Use	Internet use time	2	Statistical analysis using SPSS
	Internet use pattern	10	
	Frequency of sending mail	2	
	Degree of Messenger use	1	
Social capital	In-degree centrality	3	Network analysis using Netminer and combing parameters with variables
	Ego-network efficiency	3	
	Average number of Participants	1	
	Achievement	Record	1

Variables and factor extraction

Key variables measured by the questionnaire and extracted from factor analysis are as follows.

a. Internet use

Internet use was measured in two different ways: Internet use time and Internet use pattern. Internet use time was measured by asking the respondents to write in how many hours on average they spent using the Internet per weekday and weekend. The two numbers were summed to create the

TABLE 2. RESULTS OF FACTOR-ANALYSIS

Items	Factor		
	Entertainment oriented	Information oriented	Learning oriented
Game and Entertainment	.752	-.106	4.530E-02
Movie and Music	.683	4.198E-02	3.004E-02
Community activity	.638	.323	3.629E-02
Messenger use	.270	.739	2.521E-02
Web Searching	5.822E-02	.736	.179
Download	-5.249E-02	.654	4.689E-02
e-learning	-8.936E-02	3.619E-02	.734
New	.272	9.395E-02	.679
Education and learning	-.386	.439	.486
E-mail	.447	.137	.454

* Factor extraction: Principal component analysis

* Factor rotation: Varimax rotation with Kaiser

Internet use time variable. Internet use pattern was measured by asking the respondents to rate the frequency of using various Internet functions using ten 4-point scales in which "1" indicated "never used" and "4" indicated 'frequently used.' Factor analysis of these ten items, as shown in table 2, generated three factors: (1) entertainment-oriented usage; (2) information-oriented usage; and (3) learning-oriented usage.

b. Social capital

This study used two variables in order to measure the type and effect of social capital. Two variables were extracted through NGR (Name Generator Questions). Asking respondents to write down three close friends' name on question sheet, NSG transformed respondents' relation pattern into a matrix form that can be used for social network analysis.

Two variables extracted from NGR were in-degree centrality and ego-network efficiency. In-degree centrality indicates the proportion of pairs in which ego is appointed as a friend over overall possible pairs. Other studies using social network analyses usually applied out-degree centrality which indicated the degree of plausible interaction. However, the out-degree centrality for each person has a similar value in this study, because we asked respondents to choose only three persons. For this reason, we ruled out the out-degree centrality.

The in-degree centrality is a useful index in that it has various values from zero to one indicating that ego is appointed as a friend by all classmates. As higher in-degree centrality is more likely to increase the number of persons with whom ego forms close relations, it urges ego to act in a way that satisfies others' expectations which support ego. This propensity increases ego's self-regulation. Consequently, the in-degree centrality exerts positive influence on achievement (Jeong, 2005).

On the other hand, ego-network efficiency based on the structural hole perspective (Burt, 1992) is related to information network in which personal relations are considered as a passage of information flow. Burt (1992) argued that structural hole had two advantages in information and control. When we apply this perspective to two social network variables, higher ego-network efficiency decreases redundancy of relations, while lower redundancy increases the opportunity for ego to form relations with various alters. As a result, ego-network efficiency provides an advantage in delivering various balanced information to ego. On the contrary, higher redundancy is more likely for ego to receive information from numerically limited clique members. Information circulated within an exclusive circle is inclined to be distorted, and strengthens prejudice by hampering information exchange with

outer circle members. Thus, effective network pattern is generally assumed to contribute to social achievement.

c. Academic performance variable

Respondents' academic performance was measured by averaging grades of three key subjects — Korean, English, and mathematics. Considering differences in average grades among high schools, each respondent's academic performance score was standardized based on the average score of his/her high school.

RESULTS

Teenagers' attitude toward the Internet and Internet use pattern in everyday life

This section compares the Internet with other media in order to explore relative use and importance of the Internet for teenagers' everyday life. The strongest advantage of the Internet is its easy and prompt accessibility to information. Generally, we define information as intangible valuable production obtained by human intellectual activity. This definition includes all sort of knowledge provided by print media such as books or newspapers as well as by electronic media such as TV.

Table 3 compares the amount of time spent using the Internet, TV, newspaper, book with the amount of time spent playing games, which are teenagers' most popular leisure-time activity. The respondents spent relatively greater time on the Internet, spending about two hours per day watching TV and using the Internet. Male students are more likely to spend time on the Internet and game, while female students are more likely to spend time watching TV. Both of them spent more time on the Internet on

TABLE 3. SPENDING TIME — SEX, GRADE, MEDIA (per day, min)

		Internet (weekday)	Internet (weekend)	TV	Newspaper	Game	Book
sex	Male	138.04	178.58	109.73	29.23	99.25	55.14
	Female	125.11	135.82	137.06	20.60	12.22	40.61
grade	1	164.49	157.22	159.49	16.06	49.39	39.29
	2	140.44	177.11	136.32	24.47	61.05	44.30
	3	93.28	131.72	83.97	31.64	43.86	56.64
Total		130.95	155.12	124.73	24.49	51.53	47.16

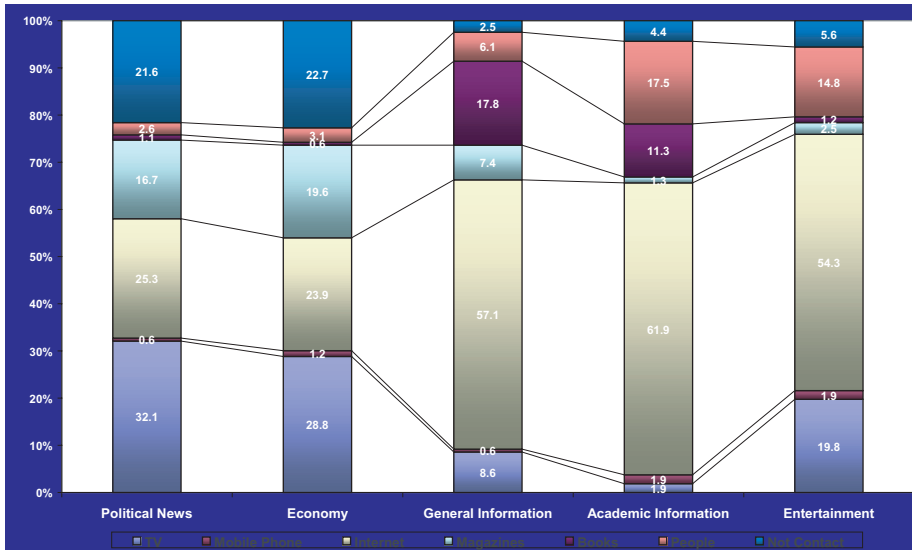


FIGURE 1. TYPES OF INFORMATION SEARCHED FOR ON THE INTERNET.

weekends than on weekdays. In general, older students were likely to spend less time on the Internet and more time reading newspapers and books.

We examined types of information respondents searched for on the Internet. Information types were categorized into politics, news, economy news, common knowledge, learning, and entertainment. Figure 1 reports which media respondents most heavily depend on to obtain each type of information. It was found that the survey respondents considered the Internet as a more important information source for common knowledge (57.1%) and learning information (61.9%) than books or personal sources. The Internet also plays a critical role in getting entertainment information (54.3%).

Teenagers’ social interaction and Internet use

This part examines how Internet use exerts influence on forming and maintaining social capital, specifically on friendship, by applying correlation analysis. We identified computer-based emailing, mobile-based emailing, and added messenger use in order to measure the average frequency of sending emails per day. Then, we measured the size of network embedded in everyday life by asking the respondents how many persons usually gathered in a meeting.

TABLE 4. CORRELATION ANALYSIS BETWEEN INTERNET USE VARIABLES AND SOCIAL CAPITAL

	①	②	③	④	⑤	⑥	⑦
① internet use time	1.000						
② Sending mail(PC)	.087	1.000					
③ Sending mail(Mobile)	-.033	.077	1.000				
④ Messenger use	.047	.185*	.111	1.000			
⑤ ego-network efficiency	-.093	.057	.030	-.075	1.000		
⑥ In-degree centrality	-.058	.157*	-.138	-.123	.072	1.000	
⑦ Average Number of Participant	.152	.013	.029	.200**	-.039	.206**	1.000

* $p < .05$, ** $p < .01$

The most important variable, Internet use time, was not related to other variables. Even though it was not statistically significant, the negative coefficients between Internet use time and both of in-degree centrality and ego-network efficiency indicated that it is less likely for Internet use time to exert positive influence on forming and maintaining social interaction. However, the email use variable that has a positive correlation with in-degree centrality seems to contribute to improve social network. Messenger use, that had a positive relation with the average number of participants, also seemed to play an important role in promoting off-line interactions.

We can not rule out the plausible effect of the peculiar classmate attribute on social interaction investigated in this study. However, the result is less likely to support previous theories that Internet use plays a critical role in expanding existing social interactions. On the contrary, when we consider that email exchanges are possible only in established personal relations, the Internet is more likely to play a complementary role in maintaining established relations.

Internet use and network effect on academic performance

This part analyzes how Internet variables and network variables, such as in-degree centrality and ego-network efficiency, affect students' academic performance through a multiple regression analysis. The result appears in Table 5.

The regression results generated two models. In the first model, sex and Internet variables were entered as predictor variables and in the second model, social capital variables were entered. In the first model, independent variables explained 9% of the total variance in the dependent variable, academic performance. The result reports that the entertainment-oriented usage

TABLE 5. REGRESSION MODEL ON THE ACADEMIC PERFORMANCE

	model 1	model 2
	β (t)	β (t)
SEX	.023(.259)	.028(.326)
Interent		
Internet use time	-.160(-1.748)	-.165(-1.940)*
entertainment oriented	-.181(-1.979)*	-.174(-2.031)*
information oriented	-.025(-.284)	-.020(-.237)
learning oriented	.141(1.630)	.147(1.823)
social capital		
ego-network efficiency		.304(3.725)**
in-degree centrality		.199(2.473)*
Constant	1.167	.806
N	357	353
R ²	.090	.223
F	2.426*	4.911**

* $p < .05$, ** $p < .01$

negatively predicted students' academic achievement. This negative relation was statistically significant at the $p < .05$ level. In the second model, 22.3% of the total variance in the dependent variable was explained by independent variables. The result indicates that not only entertainment-oriented usage but also Internet use time have negative relations with academic achievement.

On the contrary, social capital variables positively predicted academic achievement. The positive relation between ego-network efficiency and achievement is in line with the Burt's argument. Higher ego-network efficiency enables delivery of various information to ego, and this information flow along with network attributes promote academic performance. On the other hand, higher in-degree centrality contributes to academic performance by increasing information flow as well as by strengthening self-regulation.

CONCLUSION AND IMPLICATION

This study's results indicate that Internet use and social capital of teenagers are significantly related to their academic performance. Unlike previous studies which mainly focused on socio-economic variables, study

patterns, and individual or psychological variables, this study introduced environmental variables such as Internet use and relation variables, and tested their effects on academic performance. This study provides the following three key findings.

First, teenagers consider the Internet as an important part of their everyday life. Male students spent more time on the Internet than do their female counterparts. However, regardless of their gender, students were more likely to spend time on the Internet on weekends than on weekdays. Those with higher average academic grades tended to spend more time using the Internet than others. Results showed that teenagers used the Internet extensively for both learning and entertainment purposes: more than a half of the survey respondents considered the Internet the most important information source for common knowledge, learning, and entertainment.

Second, examining the relation between Internet use and social interaction of teenagers, we found that the amount of time spent using the Internet was not significantly related to the social network. However, results indicated that the frequency of sending emails was positively related to in-degree centrality, and the degree of messenger use had a positive correlation with the number of participants in a meeting. This study's results do not seem to be in line with the existing literature that suggested Internet use as an important factor in the construction of new social relations. Nevertheless, considering that messenger and e-mail exchanges assume established relations, Internet use seems to play a complementary role in maintaining established relations among teenagers.

Third, examining the effect of social network variables on academic performance through a multiple regression analysis, results indicated that Internet use time and entertainment-oriented usage were negatively related to achievement, while social network variables such as in-degree centrality and ego-network efficiency exerted significant and positive influence on achievement. In other words, the higher in-degree centrality and ego-network efficiency are the higher academic grades students are likely to get. Based on this study's results, the following public policy implications are suggested. First of all, our efforts for improving students' academic performance should be shifted toward focusing on promoting relations between classmates from investing in private education. This orientation coincides with the educational objective of public education that seeks to cultivate humanity. For this purpose, we need to strengthen community activity as well as to encourage collectivity emerging from self-dedication. This attempt will transform the collapsed school into new environment in which teenagers are able to realize true meaning of living together by experience.

As Coleman's study (1988) indicates, considering the influence of parent's social capital on social achievement, parents also need to expand their concern from their own children toward their children's social environment.

Second, it is an interesting finding that entertainment-oriented Internet usage is negatively related to the academic performance, while learning-oriented usage is unrelated with achievement. This result indicates that educational contents on the Internet are unlikely to contribute to academic performance of teenagers. As a result, we need to reappraise educational contents on the Internet. Under the condition that students spend more time on the Internet and depend more on the Internet as an information source, it would be critical to develop educational contents that can stimulate students' interests. If we pass over the importance of this task, it will eventually deteriorate state competitive power.

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***BAE YOUNG** is an assistant professor of information Sociology at Soongsil University. He received his Ph. D. in sociology from Yonsei University. His current research interests include sociology of organizations, social capital theory, and social relationships in cyberspace*