

Effects of the Internet use on elementary school students' attitude toward learning

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To examine the effects of daily Internet use of elementary school students on the attitude toward learning, a two-wave panel study was conducted with 5th and 6th-grade elementary school students. As a result, the amount of Internet use indicated significant positive effects on attitude toward learning. In other words, among various usages of Internet tools, Web-site browsing and message-posting to a BBS had positive effects on motivation for learning. Also, Web-site browsing and Web-page making, had positive effects on self-efficacy. As just described, results suggested the possibility that Internet use by elementary school students may have positive effects on their attitude toward learning, but the effects were not strong overall. Therefore, rather than concluding that daily Internet use of elementary school students has positive effects on their attitude toward learning, it can be concluded that such Internet use does not have any negative effects on their attitude toward learning.

Introduction

In today's advanced information society, there has been an increasing demand for information education in Japanese elementary and secondary education, causing rapid computerization of classrooms. For example, as of March 2003, almost 100% of elementary and secondary educational institutions in Japan owned computers, and 99.4% of such elementary schools had computers with Internet access (Ministry of Education, Culture, Sports, Science and Technology of Japan, 2003). Although the numbers cited for the Internet access above are based on the number of computers with an Internet connection in a computer room provided in each school, the goal for the government is to have 100% Internet access from regular classrooms of all public schools in Japan by 2005.

Such plans have been established based on the assumption that Internet use should have positive educational effects on children, and several researches reported its educational effects.

For example, a study with elementary school students (Skinner & Preece, 2003) reported that, through classes using Web-based teaching materials of science, students improved their scientific understanding as well as motivation for learning. These types of studies, however, usually examined the educational effect of specific application software or creatively structured classes, and there were still only a few studies that examined the educational effects of daily and free Internet use at school or at home on the motivation for elementary school students to learn. The Internet is now usually available for school children to freely use, and the Internet also has been spreading to households. Therefore, it is necessary to pay attention not only to the educational effects of the Internet observed under control of educators but also to its effect resulting from its free use in the environment which is not necessarily under the adult control.

A panel study with Japanese senior high school students (Mori, et al., 1999) suggested that daily use of the Internet did

improve motivation for learning for the subjects. In addition, an interview survey with senior high school students at 30 schools in Iowa (Maushak, et al., 1999) resulted in a report that motivation to learn by students improved due to the introduction of computers with Internet access. In general, introduction of information devices to the classroom is said to transform the conventional teacher-centered classes into student-centered classes, and such changes make the students responsible for their own learning activities. In this study, the students who learned how to collect information then started to actively collect information instead of waiting for their teachers to teach something as seen in the conventional manner (Maushak, et al., 1999). Note, however, that these results were obtained from senior high school students who were already relatively mature, and it is not possible to generalize that the same effects would be observed for elementary school students.

As mentioned above, it seems that the Internet has some educational effects for children. But there are concerns to consider in this hasty introduction of the Internet to classrooms.

For example, Stoll (2000) pointed out that multimedia systems such as computers or the Internet may lower or decrease children's problem-solving ability, intellectual curiosity, and motivation for learning. Also, Armstrong & Casement (2000) pointed out that lessons with heavy use of computers or the Internet would have negative effects depending on the subject of study. They then pointed out that use of computers or the Internet would cause negative effects on young children, especially elementary school students. Because as a result of computer or Internet use they would have fewer opportunities to deal with issues that would require high-level thinking (Armstrong & Casement, 2000).

These opinions above seem to imply that too much Internet use by children may cause negative effects not only on school performance but also on the attitude toward learning, such as motivation for learning or self-efficacy.

Shiomi (1994) stated that "children start to understand the fun of learning when they are in 5th or 6th grade (p. 6)." Study habits and attitude toward learning, including interest in studying, are however essential for continuing and expanding the learning experience, and their early growth is expected also from the point of view of lifelong learning. Furthermore, children still at the development stages are, in general, easily affected by external factors and thus it is believed that they are also easily influenced by new media such as the Internet.

Therefore, if there are concerns about hasty introduction of the Internet to classrooms, further investigation is required. Also, if negative effects of Internet use on attitude toward learning are detected under such conditions, then it could be attributed to the free and daily use of the Internet at school or at home which is not necessarily under the adult control rather than to the Web-based materials or classes specifically established for positive educational effects. Therefore, it is necessary to examine the effects of daily Internet use on the attitude of elementary school students toward learning.

Thus, in the study of this paper, the effect of daily Internet use on attitude toward learning was examined with elementary school students. Note that the following three elements of attitude toward learning were examined: 1) "motivation for learning," or, voluntary attitude toward learning; 2) "interest in study," resulting from thoughts that studying was fun; and 3) "self-efficacy" to promote active approaches to various issues (Shiomi, 1994). These three elements were chosen since willingness to voluntarily and actively learn, interest in studying, and a belief that problems could be solved if enough efforts were made are all important in continuing and expanding learning experience.

Also, the amount of Internet use was examined in this paper for each Internet tool and for each purpose. The majority of the previous studies examined the amount of overall Internet use or the amount of Internet use by Internet tool, but in order to examine in further detail, examination of the amount of Internet use by purpose was also considered necessary.

The specific study method used in this study was a panel study in which the relationship between the amount of Internet use and attitude toward learning was measured at two different time points. Although causal relationships between variables could not be estimated if data was obtained only once, data could be analyzed by the structural equation model if it was taken twice, and therefore the causal relationship between variables could be estimated to a certain degree (Finkel, 1995).

Method

Participants and procedure

817 students from eight public elementary schools in Tokyo having computers with high-speed Internet access participated in a two-wave panel study. These surveys were conducted twice with a three month interval by using questionnaires during classes. Data obtained from 702 students (352 males and 350 females) who answered both surveys was analyzed.

Survey

Amount of Internet use

The subjects were asked how much in total they used the Internet at home and at school in a week. For Internet use by tool, the subjects provided the amount of their Internet use by: 1) using e-mail; 2) browsing Web-sites, BBS, or reading e-mail magazines; 3) making Web-pages; 4) posting messages to BBS or mailing lists; 5) chatting; and 6) playing on-line games. For Internet use by purpose, they provided the amount of their Internet use for: 1) classes; 2) homework or studying; 3) hobbies or other favorite activities; 4) interpersonal exchange; and 5) making new friends. For the total amount of Internet use for a week, the subjects responded by using a 7-point scale: "none," "less than 10 minutes," "10 to 30 minutes," "30 minutes to 1 hour," "1 hour to 2 hours," "2 hours to 3 hours," and "more than 3 hours." Each response was converted to a point such as "none = 0" and "more than 3 hours = 6." Note that the subjects were asked to include the use of PHS or cellular phones as Internet use when they answered the question.

Attitude toward learning

In order to measure the attitude toward learning of elementary school students, necessary changes were made to the following measurement scales so that questions were appropriate for them. The subjects answered each question by using a 4-point scale ranging from "Strongly disagree" to "Strongly agree."

1) Motivation for learning To measure voluntary attitude toward learning, from "the index of students adjustment to school life" developed by Naitou, et al. (1986) for use with senior high school students, four out of six questions regarding motivation for learning were selected as appropriate questions for elementary school students. The selected questions were then revised in terms of wording and expression so that the subject students could understand and respond to them. These questions include items such as "I work hard towards the goal every day," for example. The a coefficient for the four items was .73 for the first survey and .73 for the second survey. The test-retest reliability coefficient was .69.

2) Interest in studying Five questions among other scale regarding reasons for studying, developed by Sakurai (1995, p.9), were selected and used. These five questions were developed to see if respondents chose to study due to their interest. The subjects were provided with questions such as "Why do you study?" They then used the same 4-point scale as above to indicate how strongly they agreed with provided answers such as "Because it is fun." For the five items, the a coefficient was .78 for the first survey and .82 for the second survey. The test-retest reliability coefficient was .61.

3) Self-efficacy From the Japanese version of the "General Self-Efficacy Scale" developed by Schwarzer, et al. (1997) to measure self-efficacy, five items out of ten that were considered applicable to elementary school students were selected, and their wording and expression were revised so that the subject students could understand and answer them. The subjects answered items such as "If I try hard enough I can solve difficult problems," for example. For the five items, the a coefficient was .67 for the first survey and .67 for the second survey. The test-retest reliability coefficient was .66.

Other variables

As demographic factors, the subjects provided their school name, grade, and gender.

Result

Means and standard deviations for the amount of Internet use

As basic data, Table 1 shows means and standard deviations for the amount of Internet use by tool as well as by purpose, both measured at the first survey.

Analysis of causal relationships

By using the structural equation model, causal relationships between the amount of Internet use by tool as well as by purpose and attitude toward learning, such as motivation for learning, interest in studying, and self-efficacy were examined.

As an analysis model, the cross-lagged effect model as shown as Figure 1 was used. Through this model, it would be possible to estimate a causal relationship. For example, if Path “a”, or the path from the amount of e-mail use measured at the first survey to the degree of self-efficacy measured at the second survey, indicated significant positive effects, it would be possible to estimate that the larger amount of e-mail use would lead to heightened self-efficacy. Conversely, if Path “a” indicated significant negative effects, it would be possible to estimate that the larger amount of e-mail use would lead to lowered self-efficacy. Although it was possible to also analyze Path “b”, or the path from attitude toward learning to the amount of Internet use, we omit the details in this paper due to the limitation on space.

Table 1. Means and standard deviations for the amount of Internet use

	<i>M</i>	<i>SD</i>
Internet use by tool		
E-mail	1.15	1.68
Web-site or BBS browsing	1.40	1.80
Posting messages to BBS	.57	1.18
Web-page making	1.16	1.71
Chat	.52	1.21
On-line game	.68	1.37
Internet use by purpose		
For classes	2.47	1.50
For homework or studying	1.53	1.52
For hobbies or other favorite activities	2.09	1.83
For interpersonal exchange	.75	1.37
For making new friends	.23	.90

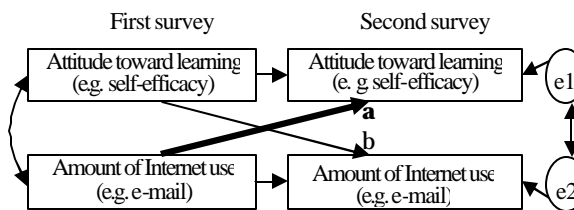


Figure 1. Cross-lagged effect model

Estimate of the causal relationships

Table 2 shows the result which was analyzed by using the analysis model as shown in Figure 1. The results are as follows.

Effects on motivation for learning

The effect of the amount of Internet use by tool on motivation for learning was examined. As a result, longer hours per week of Web-site and BBS browsing as well as message posting to a BBS caused improvement of motivation for learning at a significant level.

Next, the effect of the amount of Internet use by purpose on motivation for learning was examined. As a result, longer hours per week of Internet use for the purpose of interpersonal exchange caused improvement of motivation for learning at a significant level. Also, motivation for learning tended to become heightened if the subjects spent long hours using the Internet for homework or for studying.

Effects on interest in studying

The effect of the amount of Internet use by tool on interest in studying was examined. As a result, there was a tendency that longer hours of Web-site and BBS browsing per week caused improvement of interest in studying.

Then, the effect of the amount of Internet use by purpose on interest in studying was examined. As a result, there was a tendency that longer hours of Internet use for doing homework, studying, and interpersonal exchange caused improvement of interest in studying.

Effects on self-efficacy

The effect of the amount of Internet use by tool on self-efficacy was examined. As a result, longer hours per week on Web-site as well as BBS viewing and Web-page making caused improvement of self-efficacy at a significant level. Also, there was a tendency that longer hours of Internet use by playing on-line games also improved self-efficacy.

Then, the effect of the amount of Internet use by purpose on self-efficacy was examined. As a result, the amount of Internet use by purpose did not show any effects on self-efficacy.

Discussion

Table 2. Effect of the amount of Internet use on attitude toward learning (path a)

	Attitude toward learning		
	Motivation for learning	interest in studying	Self-efficacy
Internet use by tool			
E-mail			
Web-site or BBS browsing	.06*	.05 ⁺	.05*
Posting messages to BBS	.05*		
Web-page making			.06*
Chat			
On-line game			.05 ⁺
Internet use by purpose			
For classes			
For homework or studying	.05 ⁺	.06 ⁺	
For hobbies or other favorite activities			
For interpersonal exchange	.07**	.05 ⁺	
For making new friends			

Note: Values shown in this table are causal coefficient estimate values (standardized coefficients). Only values indicating significant effects or tendencies are shown in the table.

** $p < .01$, * $p < .05$, ⁺ $p < .10$. $N = 702$

Effects on attitude toward learning

Review of the effect of Internet use on attitude toward learning suggested that Internet use had positive effects mainly on motivation for learning and self-efficacy. These effects were however not very strong; therefore, the study result seemed to suggest that daily Internet use by elementary school students at school or at home did not result in any negative effects on their attitude for learning, rather than suggesting that Internet use by these students had positive effects on their attitude for learning. Thus, as indicated through some previous studies (Meyer, et al., 2002; Skinner & Preece, 2003), negative effects of the Internet on attitude for learning or school performance were not likely to be detected when school classes were carried out using Web-based materials or the Internet that were well-planned based on expected educational effects, and rather, detection of positive effects could be expected.

The study results that indicated significant effects or tendencies are discussed in the following sections.

Effects on motivation for learning

On motivation for learning, Internet use such as Web-site browsing or message posting to BBS had significant positive effects. Also, Internet use for the purposes of interpersonal exchange had the same effect, and Internet use for the purpose of study had the same although weak effect. Since elementary school students usually develop friendships with those who are at the same school, it is highly likely that their partners of interpersonal exchange are their school friends. Also, elementary school students quite frequently study together, but now that Internet use has been spreading, students may have more opportunities to “study together” via BBS or other Internet tools. Due to the addition of “via the Internet” to a variety of methods to “study together,” students can study at their own pace, possibly resulting in growth of voluntary attitude for learning. Note, however, that these results were smaller than that of those detected for senior high school students (Mori, et al., 1999). Therefore, for elementary school students who were still immature, the Internet may have higher educational effects if it was used under appropriate instructions rather than being used in free environments which is not necessarily under the adult control.

Effects on interest in studying

On interest in studying, Internet use such as Web-site browsing had positive effects. Also, Internet use for the purposes of studying, doing homework, or interpersonal exchange had the same effects. Although the above mentioned effects were all weak, this result was meaningful since it demonstrated that daily and free Internet use by elementary school students would not discourage intellectual curiosity as Stoll (2000) was concerned.

Effects on self-efficacy

On self-efficacy, only Internet use by tool indicated positive effects and not Internet use by purpose. Web-site browsing,