

Children and the Internet in Japan : Effects of Internet Use on Learning and Social Adjustment

Mieko TAKAHIRA
Chubu University

Reiko ANDO
Kinjo Gakuin University

Akira SAKAMOTO
Ochanomizu University

Abstract

With the advent of the information society, the use of Internet technology in school education has been widely promoted in Japan. In addition, with the widespread use of mobile phones with Web functions, even among teenage children, the chances for children to use the Internet in and out of school has dramatically increased. In this paper, we summarized the effects of Internet use on children's learning and social adjustment using findings from studies we conducted in Japan with elementary, junior high, and high school students aged 10 to 18 years. With regard to learning, we looked at effects on information literacy and the four areas of academic ability, namely, interest, motivation, and active attitude toward learning; knowledge and understanding of subjects; profound thoughts about subjects; skills for learning and problem solving. With regard to social adjustment, we looked at effects on aggression, mental health, preference for Internet communication, social support, and self-disclosure. We found that Internet usage has both positive and negative effects on children in terms of learning and social adjustment. Finally, in the light of research findings so far, we discussed the skills needed by children for properly and effectively using the Internet.

Key words: Internet use, academic ability, sociality, mental health, late childhood and early adolescence

1. The advent of the information and communication era

With the widespread use of information and communication technology (ICT) represented by the Internet, information networks are expanding on a global scale. The advent of the information and communication society has greatly changed the political, economic, and cultural landscape. To catch up with this wave of innovation, Japan has intensively pushed for the procurement of ICT infrastructure in elementary, junior high, and high schools, beginning around the year 2000. As a result, almost all public schools nationwide have an Internet connection. Furthermore, in Japan, teenage children have wide access to Internet use, even outside school, because of the widespread use of mobile phones equipped with web functions, which children use for e-mailing friends and for browsing mobile and PC websites.

We therefore asked how this everyday use of the Internet, in and outside school, affects the development of children. Government and education officials are hoping that promoting "informatization of education" will

enhance learning in different subjects, as well as improve information literacy. Conversely, apprehensions about the negative effects of Internet use in children also exist, as shown by the increasing concern about the problem of cyber-bullying.

In this paper, we discuss the effects of Internet use on the learning and social adjustment of children, mainly using the results of our studies with elementary, junior high, and high school students in Japan.

2. Effects of Internet use on learning

As mentioned previously, the Japanese government has actively promoted the provision of Internet connectivity in all schools and the creation of a school environment in which students can use computers in all subjects, with the aim of informatizing education. It has also begun to implement full-scale initiatives to improve the ability of teachers to utilize ICT in education. The government expects that this aggressive promotion of informatization of education enables (1) the improvement of information literacy in children and (2) the achievement of curriculum goals in all subjects (i.e., improvement of academic ability) (Ministry of Education, Science and Culture of Japan,

2002).

However, it remains to be seen whether the use of ICT in education is actually producing the positive effects on learning (i.e., improvement of information literacy and academic ability) that are expected.

2.1 Relationship of the use of the Internet and other ICT tools with information literacy

Firstly, we will discuss the relationship of “improving information literacy,” one of the main goals of education informatization, with the use of Internet and other ICT tools. According to the Ministry of Education, Science and Culture of Japan (2002), “information literacy” has three components, namely, (1) “skills for practical use of information,” (2) “scientific understanding of information,” and (3) “readiness for the information society” (also referred to as “attitude toward participating in the information society”). Details of each of the components are shown in Table 1. According to the table, (1) “skills for practical use of information” are almost equivalent to what is commonly referred to in other countries as “information literacy,” which pertains to the set of information-processing skills needed for independently choosing and utilizing information and ICT tools; (2) “Scientific understanding of information” refers to the basic knowledge needed for properly using information and ICT tools; and (3) “readiness for the information society” refers to the ethics and manners needed for adapting to, and living in, the information society.

These components of information literacy are essential for independent survival in the advanced information and communication society; without adequate acquisition of these skills, an individual cannot properly utilize information and will be subject to various disadvantages in daily life. Thus, improving information literacy in children will be a pressing issue in school education in the coming generations. We then asked what efforts are being made to enhance information literacy in children in Japanese schools, and how are these effects being evaluated?

2.1.1 Effects of ICT use in school education

In the guidelines for education set down by the current

Japanese government, “Information and Computers” is a compulsory subject in technical areas, such as Industrial Arts and Homemaking, in junior high schools. In high schools, a course on “Information” has been instituted as a compulsory subject, as part of the regular course work. These information-related subjects primarily address the (2) “scientific understanding of information” component of information literacy, and the improvement of this component (2) can be assessed through tests administered in these information-related subjects.

Conversely, it is considered that the (1) “skills for practical use of information” and (3) “readiness for the information society” components of information literacy defined above are acquired not only through these information-related subjects, but also through practice of the proper use of ICT tools in different subjects (e.g., through learning activities in science classes that use computers and use of the Internet to search for, and learn about, objects and events in nature)(Investigative Commission on Informatization of Primary and Secondary Education, 2006). In other words, teachers are expected to have the ability to effectively use ICT tools to accomplish the curriculum goals of each subject, as well as to improve information literacy, specifically components (1) and (3) above.

However, when ICT is used in each different subject, it makes it difficult to assess its overall effect on information literacy in school education on. Naito et al. (2001) and Kashibuchi et al. (2003) conducted quasi-experimental studies in which they compared improvements in the information literacy of children attending a school that uses the Internet (i.e., a school with a high-speed Internet connection and wide use of the Internet in its classes) with that of those from a school that does not use the Internet (i.e., a school with no high-speed Internet connection and no use of the Internet in its classes). The quasi-experimental study is an effective method to use in deciding whether treatments have an effect in actual situations (Cook and Shadish, 1994). An appropriately designed quasi-experiment allows for the testing of the relationship between the treatment (e.g., Internet use in school education) and the change in the affected dependent

Table 1. The three components of “information literacy” (The Ministry of Education, Science and Culture of Japan, 2002)

Name of component	Definition
(1) Skills for practical use of information	The set of information-processing skills needed for independently choosing and utilizing information and ICT tools
(2) Scientific understanding of information	The basic knowledge needed for properly using information and ICT tools
(3) Readiness for the information society (Attitude toward participating in the information society)	The ethics and manners needed for adapting and living in the information society

variable (e.g., the information literacy of children).

According to the results of Naito et al. (2001), junior high school students enrolled in the school that used the Internet had higher “skills for practical use of information” compared to students in the school that did not use the Internet in its classes. This indicates that Internet use in school activities helped in increasing the ability of students to use information practically. In this research, they proposed that “skills for practical use of information” are composed of six sub-skills, namely, “the skill of collection,” “the skill of judgment,” “the skill of expression,” “the skill of processing,” “the skill of creation,” and “the skill of communication” (Table 2). In terms of these skills, students in the school that used the Internet in its classes had particularly better skills of collection, judgment, expression, processing, and communication, compared to the students enrolled in the school that did not use the Internet in its classes.

However, in another study conducted with junior high school students, Kashibuchi et al. (2001) showed that, in terms of “readiness for the information society,” students enrolled in the school that used the Internet did not show any particular improvement.

2.1.2 Effects including those of ICT use outside school

The studies mentioned above assessed the effects of the use of ICT tools in school education on the (1) “skills for practical use of information” and (3) “readiness for the information society” of students. However, even outside school, children are widely exposed to the Internet and other ICT tools in their everyday activities. Thus, ICT use outside school may also play a role in developing their information literacy. To address this issue, we performed three panel studies in elementary, junior high, and high school students (Takahira et al., 2002; Takahira et al., 2003; Takahira et al., 2007a).

A panel study is a type of longitudinal survey wherein the same questionnaire is administered more than once

to the same participants within a certain time interval (Finkel, 1995). It is not usually possible to estimate any inter-variable causal relationships from a cross-sectional survey. In other words, even if there is a positive correlation between Internet use and information literacy in this type of survey, the direction of influence cannot be identified. It is possible that increased use of the Internet can contribute to improvement of information literacy, but it is also possible that those who have a high level of information literacy may tend to use the Internet more than others. However, if data are gathered at several different points in time from the same participants, it is possible to more clearly estimate the inter-variable causal relationships, because individual changes in a set of variables can be measured. A panel study enables examination of the effect of daily internet use in as natural an environment as possible, because we do not have to manipulate variables in order to estimate the causal relationships, unlike in an experimental study, and therefore has a large number of advantages when examining the effects of the daily activities of children.

In our panel studies, in many cases we have found that everyday Internet use, including that outside school, improved the skills of elementary, junior high, and high school students with regard to practical use of information. In other words, children who used the Internet more in their everyday activities improved their skills for practical use of information. In particular, the more children browsed websites to find information by themselves, the more their skills improved. In addition to this, elementary school children increased their skills by using e-mail or chat to exchange information with others.

In terms of the six sub-skills (Table 2), for all levels (i.e., elementary, junior high, and high school), Internet use resulted in improvement of skills of collection in particular, followed by improvement of skills of judgment, expression, and communication. However, no improvement was found in skills of processing and

Table 2. Six sub-skills of “skills for practical use of information”

Name of sub skills	Definition
(a) Skill in collecting information	The ability to subjectively and sufficiently collect necessary information by an appropriate means according to the purpose
(b) Skill in judging information	The ability to select necessary information from a large volume of available information, judge its contents, and extract the most appropriate information
(c) Skill in expressing information	The ability to understand the characteristics of information expression methods and organize information in an appropriate form
(d) Skill in processing information	The ability to appropriately process the collected information and to extract and understand necessary information
(e) Skill in creating information	The ability to create information based on one’s own ideas or opinions
(f) Skill in communicating information	The ability to communicate information while understanding the recipient’s status and ability to process the information

creativity. High school students who used the Internet more had lower creative skills, showing that Internet use could also have a negative effect.

However, the panel studies mentioned above were all conducted in less than 6 months, and so only measured the short-term effects of Internet use. In contrast, Omi et al. (2006) conducted a 1-year panel study in junior high school students to determine long-term longitudinal effects. The results showed that Internet use resulted in an improvement of skills for the practical use of information that was greater than that observed in the short-term panel study. Furthermore, although Internet use resulted in some negative effects in the short-term studies, the long-term study showed otherwise. This indicates that a longer period of study is needed to properly assess the robust effects of everyday Internet use on skills for the practical use of information.

We also conducted a panel study to determine the effects of everyday Internet use on readiness for the information society among high school students (Takahira et al., 2002). The results showed that, unlike with skills for practical use of information, everyday Internet use did not have any significant effects on readiness for the information society.

2.1.3 Summary and future issues

The above studies on the effects of Internet use on information literacy indicate that, regardless of whether ICT use happens inside or outside of school, Internet use generally increases (1) "skills for practical use of information." In particular, skills of collection, judgment, expression, and communication were more easily improved through Internet use. This could be attributed to the fact that since the use of the Internet and other ICT tools increases opportunities for dealing with information actively and independently, it enables children to naturally acquire skills for collecting, sorting, and communicating information.

Meanwhile, these findings indicate that more deliberate initiatives are needed to improve skills of processing and creativity. Skill of processing refers to the ability to appropriately process collected information, and identify necessary information, and skill of creativity refers to the ability to create information based on one's own ideas or opinions. Thus, if children do not properly acquire the skills of processing and creativity, even though they may be good at collecting and communicating a large amount of information, they will not be able to carefully examine the meaning of this information and be capable of enriching it using their own ideas. The development of skills to process and create information must be emphasized in information literacy education to address these deficiencies.

In contrast with skills for the practical use of information, (3) "readiness for the information society"

was not improved by the use of the Internet and other ICT tools. This finding suggests that improving readiness for the information society among children calls for more exhaustive educational intervention programs than are needed for improving skills for the practical use of information. There is an urgent need for effective programs that are geared towards acquiring the proper "readiness for the information society" to prevent children from getting embroiled in difficulties in this particular society.

2.2 Relationship of the use of the Internet and other ICT tools with academic ability

Next, we will look at the relationship of "improvement of academic ability," the second objective of the informatization of education, with the use of the Internet and other ICT tools. According to the education guidelines laid down by the Ministry of Education, Science and Culture of Japan, academic ability is defined as "knowledge and skills in related subjects, active attitude toward learning, and comprehensive ability and skills for learning and problem solving."

In the following sections, we will discuss the effects of the use of ICT in subjects on the improvement of academic ability. In addition, we will also discuss the effects of ICT use outside school.

2.2.1 Effects of ICT use in school education

The effects of ICT use in school education have been studied, using elementary, junior high, and high school teachers as participants, in a nationwide survey by the Ministry of Education, Science and Culture of Japan, and the Japan Society for Educational Technology (2005). In this study, teachers were shown specific teaching situations in which ICT was used in the teaching of each subject (e.g., math) and were asked to evaluate whether the academic ability of children would improve if ICT was used in the classes. The results showed that teachers believed that use of ICT in elementary, junior high, and high school classes is useful in improving academic ability. ICT use was considered as especially useful in enhancing the "interest, motivation, and active attitude toward learning" of the students. However, these results could have been influenced by the teachers' own bias and expectation that "using ICT in classes can surely improve students' academic ability."

The Ministry of Education, Science and Culture of Japan and the National Institute of Multimedia Education (2007) more recently used an approach that more directly examined the relationship between ICT use in classes and the academic ability of children. In this approach, teachers from all over Japan who had actual experience in teaching classes using ICT were asked to evaluate whether the use of ICT led to an improvement in academic ability, compared with classes in which they did

not use ICT. The results showed that ICT use led to an improvement in academic ability, particularly in terms of “interest, motivation, and active attitude toward learning,” followed by “knowledge and understanding of subjects,” “profound thoughts about subjects,” and “skills for learning and problem solving.”

The use of ICT in classes has the potential to bring about a shift from a teacher-centered to a student-centered educational structure. Thus, the use of the Internet and other ICT tools in the learning process could stimulate the interest of students and become the driving force for the cultivation of a more active and independent attitude towards learning.

2.2.2. Effects including those of ICT use outside school

The studies mentioned above assessed the effects of the use of ICT tools in school education on the academic ability of students. However, the active use of the Internet and other ICT tools by children in their everyday activities outside school could also contribute to the improvement of their academic ability, particularly in terms of interest, motivation, and active attitude towards learning.

One example of previous research that focused on this in particular is a panel study conducted with junior high and high school students to determine the relationship between everyday Internet use and their “motivation to learn,” that is, voluntary attitude towards learning (Mori et al., 1999). The results of this study showed that Internet use increased the motivation to learn among high school students. Likewise, a panel study we conducted with elementary school students also showed that Internet use could improve “motivation to learn” and “self efficacy” (i.e., confidence in one’s own ability to solve problems) (Ando et al., 2004).

2.2.3 Summary and future issues

The above studies on the effects of Internet use on academic ability indicate that, regardless of whether use of Internet and other ICT tools is within the confines of school education or not, it enhances the “interest, motivation, and active attitude toward learning” component of academic ability in children. Some recent surveys have indicated that Japanese students have an alarmingly low motivation to learn (International Association for the Evaluation of Educational Achievement, 2003; National Institute for Educational Policy Research, 2005; 2007). Therefore, the results above that indicated that ICT use could increase such motivation are noteworthy.

Use of ICT also affected “knowledge and understanding of subjects,” “profound thoughts about subjects,” and “skills for leaning and problem solving.” As such, studies of the effects on these variables should be extended, using more objective means of evaluation, such as paper

test scores, rather than subjective reports by teachers and students, to increase the objectivity of the results. Therefore, some studies have started using test scores for math, social studies, and science subjects in elementary school, and for math and science subjects in junior high and high school, that are taught with and without the use of ICT (Ministry of Education, Science and Culture of Japan and the National Institute of Multimedia Education, 2007).

In a study conducted in the UK to determine the relationship between nationwide academic test scores and the provision and use of ICT in schools, it was found that schools fully equipped with ICT, or those that have extensively used ICT in classes, showed higher test scores (Becta, 2003a, 2003b). The “National Academic Ability Survey” has been implemented in Japan since 2007, using a standard test to assess academic ability of students. This will eventually enable assessment of the effect of ICT on academic ability in a similar manner to the UK study.

3. Effects of Internet use on the social adjustment of children

In this section, we will discuss the effects of Internet use on the social adjustment of children. As mentioned previously, informatization of education has resulted in the increase of the use of ICT inside and outside school, and has primarily had a positive effect on learning. However, in terms of social adjustment, many concerns have been voiced regarding the negative effects of ICT, the so-called “dark side of informatization.”

For example, in a US study, the majority of parents with children aged 8 to 17 years old believed that “going online too often might lead children to become isolated from other people” and “children who spend too much time on the Internet develop anti-social behavior” (Turow and Nir, 2000). In a study we conducted in Japan with high school students (mean age: 15.83 years), parents (mean age: 45.36 years), and teachers (mean age: 36.85 years), we found that teachers and parents were concerned that interaction with people through the Internet increases the aggression, mental health, and excessive preference for Internet communication instead of face-to-face communication in children (Takahira, 2007).

The news reports of cyber-bullying, the onslaught of websites showing illegal and harmful information, and other unpleasant stories about the negative effects of Internet use have led to the apprehension in parents and teachers that “spending too much time on the Internet leads to social maladjustment.” Are these concerns justified? In this section, we will discuss this problem primarily using the results of our own researches.

3.1 Effects of Internet use on aggression

Firstly, we will examine the effects of Internet use on aggression; specifically, whether “spending too much time interacting with people through the Internet leads to aggression.” Few previous studies have assessed the relationship between everyday Internet use and aggression in any age group. However, studies regarding the effects of TV, video games, and other traditional media, suggest that Internet use could also lead to increased aggression in children (Sakamoto, 2003).

We conducted three separate panel studies with elementary, junior high, and high school students. This enabled us to determine whether any causality exists between everyday Internet use and increased aggression in children (Takahira et al., 2006; Takahira, 2007; Takahira et al., 2008). According to the definition of Ando et al. (1999), we used the term “aggression” to include four aspects, namely, (1) anger (e.g., “Sometimes I can’t control my temper”), (2) hostility (e.g., “I think there are many people who don’t like me”), (3) verbal aggression (e.g., “When I don’t agree with my friends, I don’t hesitate to tell them”), and (4) physical aggression (e.g., “I think I’ll hit back when somebody will hit me”).

Our results showed that at all levels (elementary, junior high, and high school), children who spent more time on the Internet tended to be more aggressive. In terms of the above four aspects of aggression, Internet use had relatively pronounced effects on “anger” in elementary school children, on “hostility” in junior high school students, and on “physical and verbal aggression” in high school students.

3.2 Effects of Internet use on mental health

We shall now assess the effects of Internet use on mental health, whether “spending too much time interacting with people through the Internet leads to depressed mood.” One famous investigation that looked into the relationship between everyday Internet use and mental health is the longitudinal study conducted by Kraut et al. (1999) in the US from 1995 to 1996. The results showed that those people who used the Internet more often, experienced a decline in mental health, despite the fact that a greater amount of interaction with others normally leads to improvement in mental health. This inconsistency, wherein a large amount of interaction led to a decline in mental health, is referred to as the “Internet paradox,” a phenomenon that has gained attention as being a harmful effect of Internet use. This decline in mental health was attributed to the restrictive nature and poor quality of interaction through the Internet, compared with face-to-face communication.

However, more recent research has indicated that the harmful effects of Internet use on mental health are not as bad as they were initially perceived to be (Kraut et al., 2002). This is probably due to the improvement in

conditions of Internet use over time, and the fact that Internet users have more adept at Internet communication, enabling them to compensate for its poor quality. However, it should be noted that these findings are from research conducted primarily with adults; the effects on children, whose intelligence and social abilities are still developing, could remain negative.

To determine the effects of Internet use on mental health in children, we conducted three separate panel studies with elementary, junior high, and high school students (Takahira, 2007; Takahira et al., 2008). Specifically, we determined whether a large degree of Internet use could lead to increased levels of depressed mood in children (e.g., “I feel like I want to cry”). Indeed, our results showed that elementary school students who used the Internet more often had more experiences of emotional decline. However, in junior high and high school students, no significant effect was observed.

3.3 Effects of Internet use on preference for Internet communication

Next, we will examine the effects of Internet use on personal human relationships, whether “spending too much time interacting with people through the Internet leads to difficulty in communicating with people in person.” The Internet enables us to interact with different people without having to worry about distance and time, making it a very convenient communication tool that has dramatically increased human potential. However, no matter how convenient the Internet is as a communication tool, if people use it for communication to such an extent that they become inept at face-to-face interaction, this could be detrimental to their daily life.

We conducted a panel study with elementary school children (Takahira et al., 2008), to find out specifically whether a large degree of everyday Internet use could lead to an increased preference for Internet communication (e.g., “Playing with others through the Internet is more fun than playing with somebody at home or outside”). Indeed, our results showed that the preference for Internet-based interaction was stronger in elementary school students who more frequently used the Internet.

3.4 Summary and future issues

3.4.1 Negative effects on aggression

Previous research has shown that everyday Internet use is a possible risk factor for increased aggression in children. Although the effect size on aggression observed in the three panel studies were not large, it is considered that any indication of increased aggression due to Internet use implies the need for formulating appropriate countermeasures.

What then should be considered in mitigating the negative effects of Internet use towards aggression in

children? One suggestion can be gleaned from the additional analysis we conducted on our panel study with high school students (Takahira, 2007). In this study, we determined whether the effects of Internet use on aggression differed for students with high and low social skills (skills for maintaining smooth interpersonal relations) and found that negative effects were more pronounced among students with low social skills, i.e., those students who did not have adequate communication skills exhibited heightened aggression only when they used the Internet.

Why was the negative effect on aggression not observed among students with high social skills? One inference we can make is that their strong social skills served to buffer the negative effects of Internet use on aggression.

Since Internet-mediated communication is mainly text-based, conveying non-verbal information, such as appearance (age, gender, clothing, etc.) and actions (tone of voice, expressions, gestures, etc.), is more difficult. However, non-verbal information plays an important role in recognizing and adjusting to the other party in the communication process. As such, Internet communication is more difficult than face-to-face communication, resulting in a higher incidence of interpersonal difficulties (Kiesler & Sproull, 1992). Moreover, repeated difficult experiences caused by Internet communication could become a factor for the heightened aggression in children. However, we considered that enabling children to develop adequate social skills, which are important in enhancing smooth interpersonal relations, earlier could reduce occurrences of interpersonal problems in Internet communication.

It is claimed that, through training, anybody can acquire the social skills needed for smooth interpersonal relations. Thus, we believe that improving social skills in children, in schools and at home, is an effective and feasible countermeasure for mitigating the negative effects of Internet use.

3.4.2 Negative effects on mental health

Our research showed that everyday Internet use led to emotional decline in elementary school children. However, in junior high and high school students, no such effects were observed. Furthermore, recent studies in adults also showed no negative effects on mental health, confirming our results in junior high and high school students.

However, after we conducted additional analysis on the results of our panel study with high school students, we found that, like elementary school children, students with low social skills tended to feel more emotionally depressed with a large degree of Internet use (Takahira, 2007). These findings point to the possibility that children who do not have adequate interpersonal communication skills are also not successful in communicating through

the Internet, resulting in increased emotional decline. Thus, as with in mitigating negative effects of aggression, we consider that enhancement of social skills is also effective in mitigating the negative effects of Internet use on mental health.

3.4.3 Negative effects on preference for Internet communication

Finally, the results of studies on preferences for Internet communication indicated that everyday Internet use led to a stronger preference for Internet-based communication over face-to-face communication. In other words, increased Internet use could possibly lead to an increasing attachment to this form of communication.

The more a child uses the Internet, the more he or she becomes adept at using it as a means of communication, naturally resulting in increased preference for the activity. However, this particular preference for Internet communication, could lead to its overuse, which could eventually lead to poor academic performance, refusal to go to school, and other maladjusted behaviors (Davis, 2001). As such, preference for Internet communication is closely related to the problem of Internet addiction, and is, therefore, an important problem that must be addressed in dealing with the social adjustment of children. Going forward, there is a need to explore methods to effectively mitigate the negative effects of Internet use on preferences for means of communication, in the same way that negative effects on aggression and mental health must also be addressed.

3.5 Positive effects on social adjustment

In this paper, we have focused particularly on the problems caused by the negative effects of Internet use on social adjustment in children, because studies involving teachers and parents have indicated that these groups are highly concerned with these issues. However, there are also studies indicating that Internet use could have positive effects on the adaptive skills of children; thus, these positive effects should also be discussed. Therefore, in this section, we will introduce some of our research findings indicating the positive effects of Internet use.

For example, we conducted a study to determine the effect of everyday Internet use on the amount of social support (support from others) that a person receives, and found that children who used the Internet more everyday became more likely to have access to more support from their friends (Ando et al., 2005). In a panel study conducted with high school students, we found that those who used the Internet more often every day tended to talk about themselves more to others (self-disclosure) (Takahira et al., 2007b; 2009).

Experiencing support from others in times of trouble, and having someone to confide in, enhances intimacy in human relationships and is important in improving

mental health. The Internet, a communication medium that is not bound by time and location, has the potential to enhance the experiences of receiving help from others, and confiding in others, by making these acts easier to carry out. Thus, we should keep in mind that although it has adverse effects on the personal relationships and mental health of children, the Internet also has the potential to enhance their social adjustment.

4. Conclusion

In this paper, among the many ICT tools, we focused particularly on the Internet and how its use can affect the learning and social adjustment of children. More specifically, we looked at effects on learning in terms of information literacy (skills for practical use of information and readiness for the information society) and academic ability (interest, motivation, and active attitude toward learning; knowledge and understanding of subjects; profound thoughts about subjects; skills for learning and problem solving). In terms of social adjustment, we looked at effects on aggression, mental health, preferences for Internet communication, social support, and self-disclosure.

Examination of these variables led us to conclude that Internet use can have both positive and negative effects on the development of children. In other words, we can harness the Internet as a communication medium to yield good results, but if we do not use it properly, it could lead to negative consequences. In this context, it can be said that technology is a neutral tool that can yield both bad and good results, depending on how it is used. Therefore, enabling children to properly understand both the features and the dangers surrounding the Internet, and helping them acquire skills for its effective use, are important issues that must be addressed by future information-education programs.

When speaking of skills for effectively using the Internet, we generally tend to think about the importance of acquiring "knowledge about the Internet" or "ethics and manners in Internet communication." Of course, teaching children about particular local rules governing the use of the Internet as a communication medium is very important in being able to use it effectively. However, the above empirical studies have shown that enhancing the more basic communication abilities, such as social skills and other factors not peculiar to the Internet, are equally important. Although they differ in many respects, it must be emphasized that Internet communication and face-to-face communication are both means of communication.

The power of the Internet and all other communication media can be harnessed differently, in accordance with purpose, character, and social skill level of the user (Bargh et al., 2002). Further studies are needed to

determine the kind of support that adults should provide to children and the kind of skills that are effective in enhancing their ability to cope in this advanced information and communication era.

References

- Ando, A., Soga, S., Yamasaki, K., Shimai, S., Shimada, H., Utsuki, N., Oashi, O. & Sakai, A. (1999). Development of the Japanese version of the Buss-Perry aggression questionnaire (BAQ). *Japanese Journal of Psychology*, 70, 384-392. (Originally in Japanese)
- Ando, R., Takahira, M., & Sakamoto, A. (2004). Effects of Internet use on attitude toward learning: A panel study of 5th-and 6th-grade elementary school students in Japan. *The Journal of Information and Systems in Education*, 3, 67-73
- Ando, R., Takahira, M., & Sakamoto, A. (2005). Effects of Internet use on junior high school students' Loneliness and social support. *The Japanese Journal of Personality*, 14, 69-79. (Originally in Japanese)
- Bargh, J. A., Fitzsimons, G. M., & McKenna, K. Y. A. (2003). The self, online: Free to be the 'real me' on the Internet. In S. J. Spencer, S. Fein, M. P. Zanna & J. M. Olson (eds), *Motivated Social Perception: The Ontario Symposium* (vol.9, pp. 195-213). NJ: Lawrence Erlbaum Associates Publishers.
- Becta (2003a). *Primary schools -ICT and standards: An analysis of national data from OFSTED and QCA by Becta*. (http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/primary_schools_ict_standards.pdf).
- Becta (2003b). *Secondary schools -ICT and standards: An analysis of national data from OFSTED and QCA by Becta*. (http://partners.becta.org.uk/upload-dir/downloads/page_documents/research/secschoolfull.pdf).
- Cook, T. D., & Shadish, W. H. (1994). Social experiments: Some developments over the past fifteen years. In L. P. Porter & M. R. Rosenzweig (Eds.), *Annual Review of Psychology* (vol.45, pp. 545-580). Palo Alto: Annual Reviews.
- Davis, R. A. (2001). A cognitive-behavioral model of pathological Internet use. *Computers in Human Behavior*, 17, 187-195.
- Finkel, S. E. (1995). *Causal analysis with panel data*. CA: Sage.
- International Association for the Evaluation of Educational Achievement (IEA) (2003). *Trends in international mathematics and science study 2003 (TIMSS2003)*. (http://www.nier.go.jp/kaihatsu/katei_h15/index.htm). (Originally in Japanese)
- Investigative Commission on Informatization of Primary and Secondary Education (2006). *Development of learning activities for information education in primary and secondary education*. (http://www.mext.go.jp/b_menu/houdou/18/08/06082512/001.htm). (Originally in Japanese)
- Kashibuchi, M., Sakamoto, A., Kobayashi, K., Ando, K., Kimura, F., Adachi, N., Naito, M., Suzuki, K., Takahira, M., Sakamoto, K., Mouri, M., Kato, A., & Sakamoto, T. (2002). The effects of Internet in school on students' readiness for informationized society: A quasi-experimental study of secondary school

- students. *Japan Journal of Educational Technology*, 26, 377-383. (Originally in Japanese)
- Kiesler, S., & Sproull, L. (1992). Group decision making and communication technology. *Organizational Behavior and Human Decision Processes*, 52, 96-123.
- Kraut, R., Kiesler, S., Boneva, B., Cummings, J., Helgeson V., & Crawford, A. (2002). Internet paradox revised. *Journal of Social Issues*, 58, 49-74.
- Kraut, R., Lundmark, V., Patterson, M., Kiesler, S., Mukopadhyay, T., & Scherlis, W. (1999). Internet paradox: A social technology that reduces social involvement and psychological well-being? *American Psychologist*, 53, 1017-1031.
- Ministry of Education, Culture, Sports, Science and Technology of Japan (2002). Practice of information education and informatization of school: New guideline for information education. (http://www.mext.go.jp/a_menu/shotou/zyouhou/020706.htm). (Originally in Japanese)
- Ministry of Education, Science and Culture of Japan and the Japan Society for Educational Technology (2005). Report on research for the improvement of course of study using IT. (<http://www.jset.gr.jp/news/pdf/youyaku.pdf>). (Originally in Japanese)
- Ministry of Education, Science and Culture of Japan and the National Institute of Multimedia Education (2007). Report on research for the promotion of informatization of education: Survey of the effects of ICT-based instruction. (http://spa.nime.ac.jp/report_2006.php). (Originally in Japanese)
- Mori, T., Sakamoto, A., Kashibuchi, M., Kobayashi, K., Katsuya, N., Suzuki, K., Ibe, N., Adachi, N., Takahira, M., Sakamoto, K., Hatano, K., & Sakamoto, T. (1999). Causal relationships among the use of the Internet, information literacy and the motive for study: A panel survey of secondary school students. *Japan Journal of Educational Technology*, 23(Suppl.), 79-84. (Originally in Japanese)
- Naito, M., Sakamoto, A., Mouri, M., Kimura, F., Kashibuchi, M., Kobayashi, K., Ando, R., Suzuki, K., Adachi, N., Takahira, M., Sakamoto, K., Kato, S., & Sakamoto, T. (2002). The effects of the Internet in schools on children's ability of practical use of information: A quasi-experimental study of secondary school students. *Educational Technology Research*, 26, 11-20.
- National Institute for Educational Policy Research (NIER) (2005). FY2003 Survey on the status of curriculum implementation in elementary and junior high school. (<http://www.nier.go.jp/kiso/timss/2003/top.htm>). (Originally in Japanese)
- National Institute for Educational Policy Research (NIER) (2007). FY2005 Survey on the status of curriculum implementation in elementary and junior high schools. (http://www.nier.go.jp/kaihatsu/katei_h17_h/index.htm). (Originally in Japanese)
- Omi, R., Sakamoto, A., Ando, R., Akiyama, K., Kimura, F., Kashibuchi, M., Naito, M., Takahira, M., Sakamoto, K., Adachi, N., Suzuki, K., Kato, S., & Sakamoto, T. (2006). Causal relationships between the Internet use and information literacy: A three-wave panel study of junior high school students. *Educational Technology Research*, 29, 25-36.
- Sakamoto, A. (2003). *Media and human development: Psychological effects of TV, video games, Internet and robots*. Tokyo: Gakubunsha. (Originally in Japanese)
- Takahira, M. (2007). *Internet use and social adjustment in children*. Proceedings of Japan Association for Education Media Study (JAEMS) 2007 Annual Conference (pp. 48-51), Akita, Japan. (Originally in Japanese)
- Takahira, M., Ando, R., & Sakamoto, A. (2006). Estimation of causal effects through longitudinal study: An example of Internet use and aggression. *The Japanese Journal of Personality*, 15, 87-102. (Originally in Japanese)
- Takahira, M., Ando, R. & Sakamoto, A. (2007a). Effect of Internet use on development of Information literacy: A panel study with Japanese elementary school children. *Computers in the Schools*, 24(3/4), 65-82.
- Takahira, M., Ando, R. & Sakamoto, A. (2007b). *Effect of Internet use on self-disclosure: A study with Japanese high school students*. Poster presented at the 42nd Australian Psychological Society Annual Conference, Brisbane, Australia.
- Takahira, M., Ando, R., & Sakamoto, A. (2008). Effect of Internet use on depression, loneliness, aggression, and preference for Internet communication: A panel study with 10- to 12-year old children in Japan. *International Journal of Web Based Communities*, 4(3), 302-318.
- Takahira, M., Ando, R., & Sakamoto, A. (2009). Effect of e-mail use on self-disclosure: A panel study of Japanese high school students. *Japanese Journal of Applied Psychology*, 34(special edition), 92-98.
- Takahira, M., Sakamoto, A., Kobayashi, K., Kashibuchi, M., Adachi, N., Sakamoto, K., Mori, T., Suzuki, K., Kimura, F., & Sakamoto, T. (2002). The effect of Internet use in non-class time on high school students' information literacy. *Japanese Society for Information and Systems in Education*, 19, 212-217. (Originally in Japanese)
- Takahira, M., Sakamoto, A., Mori, T., Sakamoto, K., Adachi, N., Suzuki, K., Kobayashi, K., Kimura, F., & Sakamoto, T. (2003). The effects of outside-class use of the Internet on information literacy of junior high school students. *The Journal of Information and Systems in Education*, 2, 96-103.
- Turow, J., & Nir, L. (2000). *The Internet and the family 2000: The view from parents the view from kits* (the Annenberg public Policy Center's Report Series. No. 33). Washington, DC: The Annenberg Public Policy Center of University of Pennsylvania. (http://www.annenbergpublicpolicycenter.org/04_info_society/family/finalrepor_fam.pdf).

Acknowledgements

This article was translated from a modified version of the Japanese book chapter whose bibliographical information was as follows: Takahira, M., Ando, R., & Sakamoto, A. (2008). Internet use and the ability of children. In T. Muto (Ed.), *Bringing up a child who likes science* (pp. 128-150). Tokyo; Kitaoji-syobo.

PROCEEDINGS 17

February 2012

Authors' Notes

Mieko TAKAHIRA

Associate Professor

College of Humanities, Department of Psychology

Chubu University

takahira@isc.chubu.ac.jp

Reiko ANDO

Associate Professor

Human Sciences, Department of Psychology

Kinjo Gakuin University

rei@kinjo-u.ac.jp

Akira SAKAMOTO

Professor

Graduate School of Humanities and Sciences

Ochanomizu University

sakamoto.akira@ocha.ac.jp