Exploring Functions in Network Literacy Practices of 15-year-old Finnish Students

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Abstract

The present study examines network literacy practices among 15-year-old Finnish students (N=4864) and explores the functions of their Internet usage. The data was gathered as a national option in the context of the OECD (Organisation for Economic Co-operation and Development) Programme for International Student Assessment (PISA) in the spring of 2000. The data from structured questions was analyzed by means of cross tabulation and explorative factor analysis across the whole sample and by gender. Four functional dimensions of Internet usage were identified: technical entertaining, technical service, communication and participation, and searching for information. Gender-based factor structures showed that the level of technical skills played a less significant role in boys' entertaining function than among girls. As technological skills make up an important part of literacy today, they also mediate and shape literacy practices and functions. The findings are discussed by comparing them to traditional literacy functions in the sociocultural frame.

Keywords: network literacy, functional reading, gender differences, the Internet
Word count: 5482 words

Introduction

> There you can find a lot of interesting stuff for example updates for games, instructions for 3D programming, DVD programs, updates for web games, chats, instructions for programming, fan pages such as star trek and stuff like that. (A boy, age 15)

> You can use it to search for information, play, listen to music, do some shopping, pay bills and other sensible things like that. (A girl, 15 years)

Literacy practices have changed radically in recent decades. Information and communication technology has transformed media, contexts, practices and purposes regarding texts and the whole literate culture (Cope & Kalantzis, 2000; Gilster, 1997; Mike, 1996; Reinking,

McKenna, Labbo & Kieffer, 1998). According to Gunther Kress (2000), there are "changes in the use, extension, and function" (p. 155). Today, literacy is defined as multiliteracy, a skill and competence needed in our everyday life to construct a new literacy culture together, which includes managing with different media, different tools related to those, and information processing skills, mastering problem solving and knowledge management (Cope & Kalantzis, 2000; Luke, 1997; Tyner, 1998). Computers and information networks are an essential part of today's literacy practices. Multiliteracy includes network literacy, which is defined as knowledge about networked information and its uses, and skills to find and combine information and use it to cope with school- or work-related as well as leisure-time situations (McClure, 1997; Tyner, 1998, pp. 75–77).

This study examines network literacy practices and the purposes of Internet usage among 15-year-old Finnish boys and girls. In addition, this article compares the functions of reading in terms of traditional and network literacy. To use computers as a part of education in a planned fashion, it is necessary to understand how students perceive the computers and the Internet, what use they make of them, and what their skills and needs are. Gender differences in computer uses play an important role, as well, since moderate use of some computer activities, especially those defined as high-level tasks (e.g. creating multimedia or programming), seem to benefit more boys than girls when it comes to reading literacy proficiency (Leino & Malin, 2006).

In the following the frame of reference of this study will first be defined on the basis of some previous sociocultural and multiliteracy studies. Then, the article focuses on the following questions: How common are certain network literacy activities for 15-year-old students? What kind of functional needs these activities fulfil? Are there any gender differences in terms of functions and usage? Finally, the findings will be contrasted with some studies of reading so as to discuss possible similarities and differences between the functions of network literacy and those of traditional literacy.

Computer use in Finland

Finnish youth have faced the changing culture with open minds. Computer and Internet use is clearly part of youth culture and adolescents' everyday life. Of the 15-year-olds participating year 2000 in PISA, 66 per cent used computers at home almost every day or at least a few times a week. Corresponding computer use at school was less common, involving still almost half of the students (46%). Only 4 per cent of the respondents never used computers. Of those who used computers, only less than 2 per cent never used the Internet. (Leino, 2002; cf. OECD, 2001, 118.)

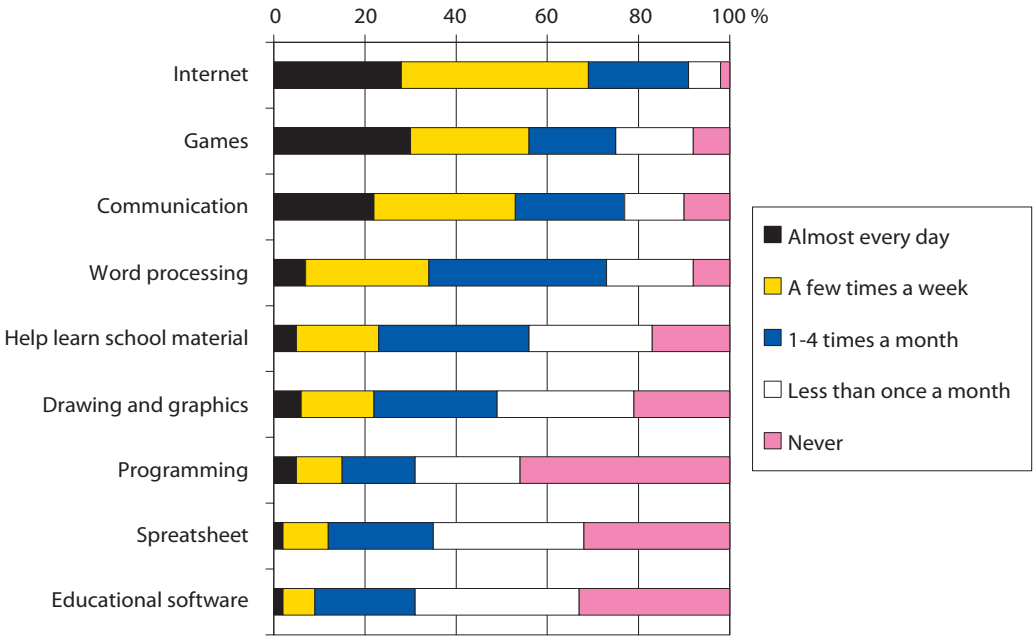

Figure 1. *Computer usage of Finnish 15-year-old students (Leino, 2002, 172)*

Using the Internet was the most popular activity with respect to Finnish students' weekly computer usage, as can be seen in Figure 1, which shows the percentage of usage across several activities. Games (56 per cent played games at least a few times a week) and electronic communication (53%), such as e-mail and chat, were also very popular. Use of different utility programs, such as word processing or spreadsheet, was less common, however. (Leino, 2002.)

Toward multiliteracy

Multiliteracy is regarded as connected to specific sociocultural events and practices, and literacy practices are seen as acts that take place in specific social, cultural, historical and institutional contexts. For different kinds of situations, contexts and texts, we need different kinds of practices. (Barton & Hamilton, 2000; Gee, 2000; Moje, Dillon & O'Brien, 2000.) Consideration of technology is justified in reading studies, as well. Lemke (1998) sees multiliteracy practices in the frame of social and technological ecology, which includes the people and the technology involved. According to Lemke, abilities to use technology are essential skills to literacy practices in an information society. Technologies shape and

direct literacy practices. For example, to produce and use hypertext, certain hardware and software technologies are essential. The mental and the material components are united in this "ecosystem" thinking. (Lemke, 1998, pp. 283–287.)

In this study, I examine network literacy practices from functional view. Network literacy refers, among other things, to an ability to navigate through Web sites, use the services of online stores and have conversations with other Internet users. Network literacy also implies understanding of how networked information is organized and how it works, what it can be used for, and how it should, or should not, be used (netiquette, nethics). (Gilster, 1997; Kapitzke, 2001; McClure, 1997; Tyner, 1998; Smith, 2000.) Network literacy practices emerge from students' own needs and interests which are embedded in broader social goals and cultural practices. People have a reason to use different texts and activities and literacy practices related to them; they are an inevitable part of their everyday life. (Barton & Hamilton, 2000.)

Texts – in a broad sense – are in the core of literacy practices, which serve different functions. Those functions are not predetermined in the sense that a text would serve only the particular purpose it is originally made for (imposed uses of literacy) but people may also use texts for their own purposes as they find appropriate (self-generated uses of literacy). That way one text can serve many functions, and the functions of reading may vary according to particular situations and between individuals. (Barton & Hamilton, 2000, p. 12; Linnakylä, 1995, pp. 14–20.)

Several studies have pointed out that the uses of new media and technologies are very much the same as the uses of print (see e.g. Ebersole, 1999). Studies of traditional literacy present different kinds of functional categorizations: Kádár-Fülop (1985) has presented four categories: reading that supports other activities (e.g. everyday tasks), reading that fills up a void of communication (e.g. reading newspapers), reading to learn, and reflective reading. Linnakylä (1995, p. 18) gives even more detailed categorization of functional literacy, which includes the following seven categories: Reading that is connected to one's surroundings and everyday tasks, reading that supports social and communal intercourse, occupational reading, reading to gain information and learn, entertaining and recreational reading, ritual reading, and reading to expand thinking and critical reflection.

Some of these functions can easily be seen also in the context of electronic texts. Ebersole (1999) specified eight functional statements concerning Web usage among American adolescents: research and learning, easy access to entertainment, communication and social interaction, something to do when bored, access to material otherwise unavailable, product info and tech support, games and sexually explicit sites, and consumer transactions. In the discussion section, I will shortly compare the findings of this present study to the results of Ebersole to see how far the answers of this representative sample of Finnish students correspond to the results obtained among American adolescents. It should be noted here that Ebersole did not consider gender differences.

Gender differences

According to the PISA 2000 results in Finland, boys' interests to use computers were partly different from those of girls. Boys were clearly more active in using the Internet on a weekly basis, although comparing usage in category of "at least once a month" the gender difference was small. Boys were more interested in playing, while less than a third of active players were girls. Programming was clearly a male-dominated hobby, as almost four out of five of those who reported they did some programming at least a few times a week were boys. On the other hand, girls used electronic communication slightly more often than boys did. (Leino, 2002.)

Several studies show that girls' and boys' needs and intentions to use the Internet do differ: girls use the Internet more often for interpersonal communication or for learning, whereas boys' purposes relate to entertainment and leisure, such as playing games (e.g. Luukka, 2001; Mumtaz, 2001; Teo & Lim, 2000; Weiser, 2000). Van Slambrouck (2000) sees that girls use the Internet more as an aid for their daily life; they seek contents that support their offline activities. Though boys do that too, they have, nonetheless, a tendency to use technology for technology's sake. Luke (1996), however, disagrees and sees that boys' interest is not only in technological features, as such, but "males socialise around computers much as they socialise around sports" (chap. 11, para. 5). Van Slambrouck (2000) also argues that men are "more patient with the process of downloading software, while women put a premium on 'ease of use' " (p. 1). In addition, compared to girls' inclination, the type of information boys are looking for is characteristically pertinent to technology and institutions or companies (Teo & Lim, 2000). Differences in Internet experiences (Weiser, 2000), content and social assumptions about appropriate interests for young boys and girls (Healy, 1998; Luke, 1996) as well as differences in the medium itself (Luke, 1996) seem to have an effect on gender differences with respect to ICT usage. Interestingly, age seems to have little effect on such gender-based usage patterns (Luukka, 2001; Weiser, 2000).

Data gathering and analysis

The data for this study were gathered as a national option included in a student background questionnaire in the context of the PISA survey (OECD Programme for International Student Assessment) in spring 2000. The survey was administered to 15-year-olds in the 9th grade of the comprehensive school. The number of students assessed was 4864, constituting a representative sample of the Finnish 15-year-olds. A two-stage stratified sampling was used meaning that first individual schools were sampled systematically with probabilities proportional to school size and then 35 out of eligible students were selected with equal

probability within school. (OECD, 2001, pp. 231–236.) In the statistical analyses sampling weights were employed to account for the two-stage sampling design.

This study focuses mainly on one set of questions on the student questionnaire: the purposes of the students' Internet usage. Students responded to the 16 questions on a five-point frequency scale: 'almost every day',' a few times a week', '1–4 times a month', 'less than once a month', or 'never'. In addition, students wrote responses to a question concerning their perceptions about the advantages and disadvantages of the Internet. A qualitative analysis and findings for that question have been reported elsewhere with a focus on critical reading (see Leino, 2006). In this article those responses are only used for illuminating purposes and to bring deeper insight into the conclusion section.

Cross-tabulations were used to identify gender differences in network literacy activities. After that, an explorative factor analysis (see Harman, 1967) was performed to find out if these activities can be grouped into broader categories representing different functional purposes (see Darlington, 1997). An explorative factor analysis was used instead of a mere research-based categorization, because activities may serve different functions in different contexts and the factor analysis could potentially indicate some uses that differ from the uses of traditional literacy. Factor analyses were performed for the both genders together as well as for boys and girls separately. The computations were carried out with SPSS software. The method chosen for factor extraction was the iterative principal axis factoring. The resulting factors were then rotated by the oblique Promax method, allowing for correlated factors.

Results

Using the Internet

Since Internet-based activities were the most popular categories for the use of computers on a weekly basis (see Figure 1), the reasons for using the Internet will next be studied more closely. Figure 2 shows that in the frequency range of at least a few times a week the most popular activities for boys were communicating via e-mail, listening to and downloading music and other music-related activities, downloading programs, searching for information and pictures for hobbies and playing Internet games.

Girls used e-mail even more than boys did. The next most popular use among girls involved different kinds of discussion possibilities, such as chat, message boards, IRC (Internet Relay Chat). This activity was almost as popular among girls as among boys. The third most frequent function for girls was participating in surveys and competitions; the fourth was searching for information and pictures for hobbies, while the fifth place was

shared by two about equally popular options, namely music-related activities and finding and downloading logos and ring tones for mobile phones. However, obviously some of the activities were such that may typically take place more seldom than on a weekly basis, such as paying bills or even updating home pages.

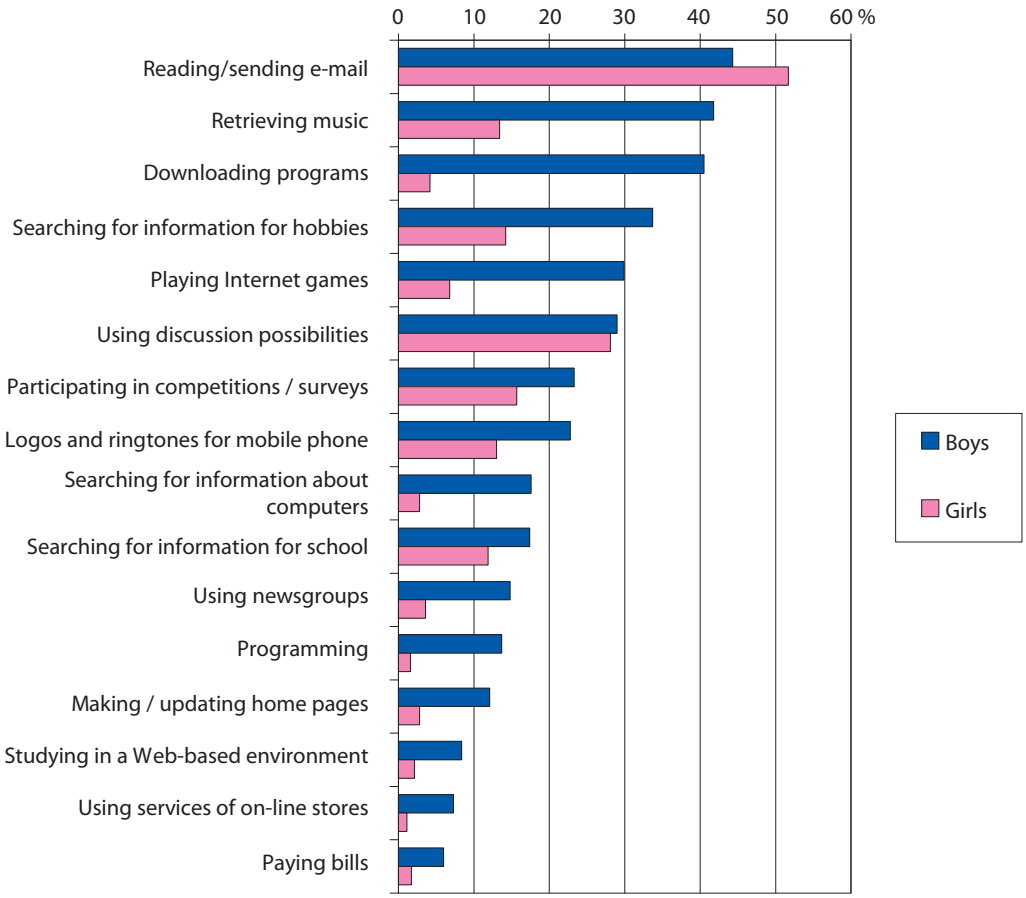

Figure 2. *Purposes for the weekly Internet use among Finnish boys and girls*

Functions of network literacy

In order to explore the purposes of using the Internet, a factor analysis was carried out. The sixteen activity items presented in Figure 2 were input to the analysis. The analysis finally resulted in a clearly interpretable four-factor solution (three initial eigenvalues clearly

exceeded 1, the fourth eigenvalue .97 being very close) explaining 52 per cent of the variance. All the item variables had communalities greater than .40 except 'downloading logos and ring tones for mobile phone' whose communality was only .35 and 'using newsgroup with communality of .34. The factor solution is presented in Table 1.

Table 1. *Factor analysis describing functional Internet usage of Finnish 15-year-olds*

	Factor 1	Factor 2	Factor 3	Factor 4
Downloading programs	.97			
Retrieving music	.77			
Playing Internet games	.58			
Searching for information about computers	(.36)			.50
Programming	.32	.50		
Paying bills		.74		
Using services of on-line stores		.77		
Studying in a Web-based environment		.62		
Making / updating home pages	(.19)	.48		
Using discussion possibilities			.68	
Reading/sending e-mail			.64	
Participating in competitions / surveys			.51	
Downloading logos and ring tones for mobile phone			(.35)	
Searching for information for school				.66
Searching for information for hobbies	(.19)			.63
Using newsgroups				.34

Four functional factors were found: The first factor could be named technical entertaining. The activities covered by this factor involve more than routine computer literacy skills (see e.g. OECD, 2005, 306) and also good network literacy skills and knowledge, even though the level of required skills do vary by the activity. The main function is to entertain. It includes activities such as downloading programs and music or just listening to music directly over the Internet and playing on-line games. As one male respondent wrote: "Best of the Internet is free music (mp3)."

The second factor, technical service, includes activities that also require more than routine computer literacy skills, such as using on-line services or making home pages. These functions make everyday life easier, as when dealing with commercial or bank services. It also includes advanced skills such as programming. One boy responded: "RAC services for mobile phone are handy: text messages, ring tones, icons."

The third factor, communication and participation, aims to entertain mostly by social activities such as discussing on chat, IRC or message boards, sending and reading e-mails and also participating in competitions and surveys. These are technically very easy to use and are mainly used to communicate with friends and to spend some time. One girl responded:

> *The Internet is a terrific way to get to know people, at least you won't be turned down right away just for your looks but for instance a good friend of mine is going steady with someone she found on chat, and is very happy. I myself also have many friends on the net.*

The fourth factor, searching for information, forms an important function of the Internet. Gaining information may, however, be related also to technical skills if the purpose is to improve one's user skills. Newsgroups resemble technically e-mail communication, but their functional use is clearly about searching for information for specific subject areas. One boy wrote: "A good thing is easy access to information. On the Internet you can find in ten minutes the same information that would take two months to dig out from books."

Interestingly, studying in a Web-based environment correlates with other activities regarded as service and technical functions instead of searching for information. Since studying in a Web-based environment is, however, still a fairly novel possibility, the threshold to participate may be quite high as students assume that this kind of activity would demand higher technical skills than it actually does. It should also be noted that all the functions correlate positively, which indicates that those students who have a tendency to use computers actively, use not just one but most of the activities.

Functions by gender

Comparing Figure 2 and the four factors presented above shows, for example, that activities getting the highest loadings in communication and participation (factor 3) are activities that were very popular among girls, while the same pattern is true for technical service (factor 2) and boys. For this reason, another two analyses were made to find out what kind of factor structure could be traced by gender. The loading structures of these two analyses can be found in Appendices 1 and 2. Among girls basically the same factors as for the whole data were detected (lowest initial eigenvalue .96), and these four factors explained 44 per cent of the variance. For boys, however, the solution of only three factors was more applicable (lowest initial eigenvalue 1.0). The three factors explained 50 per cent of the variance among boys.

The activities that among girls formed the two factors representing the functions of technical entertaining and communication and participation were combined into one factor among boys. Boys' higher comfort with and perceived ability to use computers (OECD, 2001, p. 275) may explain why the level of technical skills seems to lose significance as regards using the Internet for entertaining purposes. Figure 3 presents a comparison of gender-based functions.

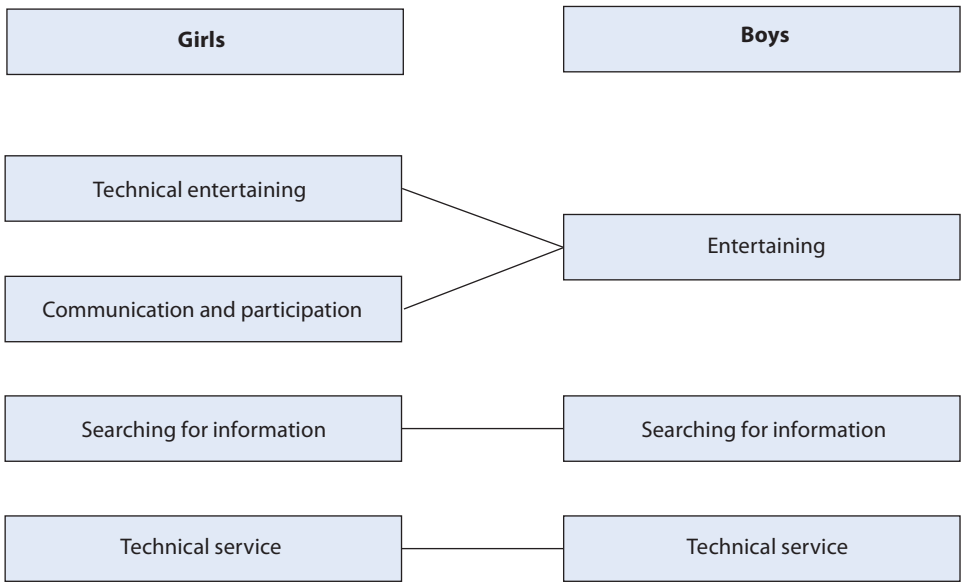

Figure 3. *Comparison of gender-based functions*

Conclusions

The findings of this study show that Finnish 15-year-old students use computers and the Internet very versatilely; communication and playing games being the most popular activities. Four main functions were identified: technical entertaining, technical service, communication and participation, and searching for information. These results reveal similar functions among Finnish students to what Ebersole (1999) found in his study among American adolescents, although these results combine Ebersole's eight functions down to four. In addition, corresponding functions have been presented in various reading studies (e.g. Linnakylä, 1995; Kádár-Fülop, 1985), with some medium-related distinctions.

As individuals' intentions and activities for Internet usage are multifaceted, the network may serve different functions for different people and in different contexts. However, some general comparisons to the functions of traditional literacy can be made. The factor of technical entertaining obviously matches with Linnakylä's (1995) category of entertaining and recreational reading as well as with Ebersole's categories of finding something fun and exciting, and something to do when I'm bored. It may even include Ebersole's category of having access to material otherwise unavailable. In addition, reading texts that support other activities, which is presented in both Kádár-Fülop's (1985) and Linnakylä's functional categories can be seen as part of it. For example, the purpose of downloading material is often to help programming or playing games and it may include reading instructions for downloading material that may not be available elsewhere.

The function of technical service is related to Ebersole's category of shopping and consumer information as well as to Linnakylä's category of reading that is connected to surroundings and everyday tasks, and Kádár-Fülop's category of reading that supports other activities. On the other hand, also the functional categories of research and learn (Ebersole) and reading to learn (Linnakylä and Kádár-Fülop) may be related to that, as studying in a Web-based environment had a quite high loading on this component.

Communication and participation – modern forms of personal letters and social chit-chat – fills up a void of communication, which is a category in all the functional theories presented in this study. It also functions as social and communal intercourse as teenagers e-mail each other tips for URLs where to find funny competitions or latest mobile phone logos to match the gang (see data, Leino, 2006). Popularity of various communication systems contradicts the stereotype of "silent Finns". Teenagers "talk" online not only to their close friends but also more widely on international channels, chat rooms and message boards (see data, Leino, 2006).

Searching for information may aim to learning, but it may also serve a broader scope of activities, i.e. gaining information also for hobbies, such as sports, computer programming, or music, to name a few. This may also enable access to material otherwise unavailable. As one student pointed out, knowledge found in newsgroups cannot always be found in books. (See data, Leino, 2006.) This is especially true for quickly developing and topical areas, such as programming.

Although the functions of Internet usage do resemble the uses of printed media, also some new dimensions occur. Supporting the "ecosystem" thinking presented by Lemke (1998), the results of this study show that in comparison to traditional literacy network literacy is affected much more by technology. User's technical skills, confidence in them and attitude to the dangers and problems of the Internet (see Leino, 2006; Leino & Malin, 2006) may have a major effect on what functions the students seek for. If the student doubts his/her ability to use functions that require more than just routine skills (e.g.

downloading), or for example has doubts about the reliability of online business (e.g. using credit cards if she/he has any), she/he is unlikely to use this type of services (see Leino, 2006; Leino & Malin, 2006). However, one advantage of the Internet is that it offers options: Those with basic skills can use simpler activities such as email to communicate with others, whereas those with advanced skills may use more demanding systems, such as IRC, to satisfy the same function.

Discussions with students and parents confirm the notion that new tools are quickly gaining ground so that, for example, e-mail is replacing personal letters and young people can reach their friends more easily in chat than meet them face-to-face. Changes in the literacy culture and in the functions of reading are clear; the ecology of reading is changing along with new tools and media. And the youth culture itself has changed while traditional basic needs have been combined with new technology-based contexts, tools and practices. Enjoyment about the written form is changing through new media to more social but also to more technical direction (see also Leu, 2002). Literacy can even be experienced as a technical challenge, if accessing a text requires advanced technical skills. This division is especially clear when gender differences are concerned.

The gender-based factor analysis revealed that the level of technical skills had less significance regarding boys' entertaining activities than it had among girls. According to Weiser (2000), gender differences stem primarily from differences in Internet experience. In terms of factor analysis this may be supported by the result that, for example, programming is placed under technical service function among boys, whereas among girls it gets a higher loading on technical entertainment. It may indicate that whilst learning to program is still just an interesting hobby for most of the 15-year-old girls, the boys are taking it more seriously to facilitate their other tasks or even to produce programs for others. This way the level of skills is associated with functions, as well.

The gender differences indicated in Figure 2 and by the results of factor analysis resemble the findings made in other surveys (e.g. Luukka, 2001; Mumtaz, 2001; Teo & Lim, 2000; Weiser, 2000). However, gender differences are getting smaller when it comes to the frequencies of students' Internet activities. To generalize, boys are more interested in technology and hardware. In comparison to girls, boys are also more often engaged in activities that require advanced technical skills, as Van Slambrouck (2000) argued. Girls, on the other hand, are slightly more socially oriented and see computers as a tool for contacting others. However, the gender difference in this area is very small. As Luke (1996) stated, boys do socialize as well. A gender difference here was that when girls use e-mail for communicating, boys prefer newsgroups.

Discussion

Finnish students are very active Internet users, but the most part of their Internet use takes place at home as part of their spare-time activities (Leino, 2002). It is logical, therefore, that most of their Internet use is hobby-related in one way or another. Although learning was not among the main purposes of these students' Internet use, many of their activities may support learning: Different functions and activities involve a number of text types and reading strategies. As far as reading proficiency is concerned, the use of computers seems to be most strongly associated with skills and knowledge related to searching for information (Leino, 2002). However, students must be guided to critically evaluate the content and practices of the networks (cf. Leino, 2006). In addition, technical and mental knowledge must be woven together in education. There are good examples on the Internet as to how information and communication technology can be used in education (see e.g. the Second Information Technology in Education Study: Module 2 – SITES: M2; http://sitesm2.org/sitesm2_search/).

Girls and boys obviously have a different kind of relationship with computers and the Internet. Especially encouraging is boys' use of e-mail: When have boys been writing letters on a weekly basis as they now do via e-mail? Or what about public debates in newsgroups or other electronic platforms where thousands of people are arguing for their particular points of view and trying to convince others? Even though we can criticize some boys for spending all their time on playing games, a moderate amount of playing may improve some visual-spatial skills, such as three-dimensional perception (Healy, 1998, pp. 160–161). Gender differences should also be considered when planning teaching, because different types of software and teaching methods appeal differently to boys and girls (Healy, 1998, p. 162). Perhaps, say, a possibility to choose between e-mail and discussion forums for exercises calling for electronic communication might make a difference for boys.

This study provides important information about the uses and functions of the Internet among Finnish 15-year-old students. Especially the representative sample size makes this study even more valuable for further studies, as well. One limitation stemming from the questionnaire was that although information was gathered about the frequencies of students' computer usage, corresponding information about the level of their skills or commitment was missing. We can expect, for example, that a person who often designs home pages has also learned something and become reasonably skilful at that. But in terms of skill level, there may still be vast differences depending on the type of activities: simple html-editing and drafting functional Java scripts for one's own Web site, or listening to music over the World Wide Web (e.g. www.mp3.com) and downloading and copying illegal mp3-format songs on a CD require very different computer and network literacy skills. More wide-ranging set of questions might have given more detailed answers. Furthermore,

some differences between the results of this study and the one carried out by Ebersole (1999) may be partly due to the concise set of questions used in this study. In addition, these data do not directly explain why girls and boys take different interests in different activities. However, students' writings concerning their perceptions about the advantages and disadvantages of the Internet do support and complement these results (Leino 2006).

Notes on contributor

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Appendix 1. Factor analysis describing functional Internet usage of Finnish 15-year-old boys

	Factor 1	Factor 2	Factor 3
Downloading programs	.86		
Retrieving music	.89		
Reading/sending e-mail	.58		
Playing Internet games	.51		
Using discussion possibilities	.44		
Participating in competitions / surveys	(.37)		
Making / updating home pages		.46	
Using services of on-line stores		.80	
Paying bills		.79	
Programming		.45	
Studying in a Web-based environment		.63	
Using newsgroups			(.35)
Searching for information for school			.76
Searching for information for hobbies			.72
Searching for information about computers			.64
Downloading logos and ring tones for mobile phone		.40	

Appendix 2. Factor analysis describing functional Internet usage of Finnish 15-year-old girls

	Factor 1	Factor 2	Factor 3	Factor 4
Downloading programs	.66			
Playing Internet games	.52			
Retrieving music	.57			
Programming	.42		.45	
Searching for information for hobbies		.62		
Searching for information for school		.59		
Using newsgroups		.46		
Searching for information about computers	.47	.47		
Paying bills			.64	
Using services of on-line stores			.57	
Making / updating home pages			.41	
Studying in a Web-based environment			.45	
Using discussion possibilities				.62
Participating in competitions / surveys				.57
Reading/sending e-mail				.59
Downloading logos and ring tones for mobile phone				.43