Assessing Computer Literacy as Related to Computer and School Attitudes

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Abstract. The tendency to use the computer and other modern information technologies as means of learning and accessing information even applies to early primary school age children. The research presented in this paper has revealed that primary school students are not only aware of the increasing importance of using computers and familiar with the purpose and ways of using computers, but also enjoy themselves while doing so. Upon analyzing the results, statistically relevant correlations were obtained between the assessed values of variables computer importance and computer enjoyment and other variables related to learning success, including motivation, study habits, creative tendencies and school attitudes, as well as empathy as a social skill variable.

Keywords. computer technology, computer literacy, computer attitudes, school attitudes

1. Introduction

Nowadays traditional forms of education are faced with ever greater challenges of information and communications technologies. From a very early age children are in a position to use these technologies, wherein how (i.e. how well) they will exploit them depends on the level of their computer (information) literacy, computer attitudes and a stimulating social environment (parents, teachers friends etc.).

Whereas computer literacy has been defined as “the ability to use a computer and its software to accomplish practical tasks” [16], computer attitude has been defined through computer importance and computer enjoyment [8].

Computer literacy is related to other contemporary forms of literacy [3] (e.g. information literacy, i.e. “the ability to know when there is a need for information, to be able to identify, locate, evaluate, and effectively use that information for the issue or problem at hand”, media literacy, i.e. “the ability to decode, analyze, evaluate, and produce communication in a variety of forms” [6]), and library literacy, i.e. “competence in the use of libraries” [3], etc.).

Certain research into this field done so far [20] has indicated that even pre-school children use various modern technologies and media to access information. For instance, 71% of children aged 5.5 to 6.5 have access to a computer and use one at home. These findings are confirmed by similar research and statistical reports (e.g. the one by the Australian Bureau of Statistics, according to which 80.3% of children aged 5-8 use a computer at home [2]).

The parents’ assessment of computer-related activities reveals that the children are most likely to play educational games, with entertainment (films, cartoons, entertainment games) and the Internet as their second choice, which is in accordance with the aforementioned results [20]. According to [2] most children use a computer for playing games (91%), for school or educational purposes (69.7%) and, finally, for accessing the Internet (24.9%).

Increasing the ICT use is a priority area in the Education Sector Development Plan for 2005-2010, as a part of the Croatian National Educational Standard developed by the Ministry of Science, Education and Sport [12]. However, Informatics, as the school subject intended to provide basic computer knowledge and skills, is not an obligatory subject in the current Croatian primary education curriculum, being merely included as an elective subject from grade five to grade eight, whereas from grade one to grade four it is mentioned as an extracurricular activity [14].

Educational units included in the Informatics curriculum [13] thus cover the content enabling students to “acquire skills for using today’s
computers and computer applications (skills) as well as to get an introduction to key principles and concepts that computers and ICT are based on (ground knowledge); furthermore, to develop the skill of implementing ICT in various fields of application (problem solving)’.

Despite the evident importance of applying ICT in classroom instruction and other forms of acquiring knowledge, there are authors who emphasize the hazard involved in their usage with pre-school and early primary school children concerning their physical health, emotional and social development, creativity and intellectual development as well as moral development, as stated in [1]. As nowadays computers are virtually inevitable, their usage should be restricted or properly channelled in accordance with a particular age group, rather than banned or prevented. It is at home that children are most exposed to computers and (other information) technologies, and this is the segment that the education system can have an impact on through school-parent collaboration [22]. Children should be engaged in purposeful computer activities which, along with providing enjoyment, should raise awareness about the computer as a means of entertainment but also a work tool, which serves as an introduction to the concept of lifelong learning that, according to the European Council, [4] is based on IT skills, foreign languages, technological culture, entrepreneurship and social skills.

IT skills are accomplished through new forms of literacy including technology literacy, digital literacy and computer literacy [3]. The aforementioned considerations have resulted in a research aimed at investigating variables computer literacy and computer and school attitude in first-graders.

The overall objective of this research is to investigate the preferences towards certain sources of information and their instructional potential, with emphasis on using computers in the knowledge-acquisition process. The specific objectives refer to the concrete assessment of the level of computer importance and computer enjoyment and their correlation with certain factors of learning success and social functioning (motivation, habits, empathy, creativity, attitudes towards school). Gender differences in the level of computer literacy were evaluated based on parameters including the recognition of parts of the computer, familiarity with basic Windows operating system commands and special keys, etc. [17].

2. Methodology

2.1. Respondents

The sample included 64 first-graders aged between 6.5 and 7.5, 29 (45.31%) of whom were girls, and 35 (54.69%) of whom were boys. The majority of children – 51 (79.69%) of them – use a computer at home, whereas 6 students (9.37%) use a computer in a public institution (e.g. library, school etc.) or another private place (their friends’ home). Only 7 out of 64 children (10.94%) claimed that they do not use a computer at all.

Prior to the survey, parents’ written consent was obtained, as well as that of the institution that the research was to be conducted in. The survey was carried out among first-graders by their teachers, who had been instructed and trained by the researchers. The students completed the survey by choosing one of the proposed answers. The survey was conducted in July 2007 among first-graders at an elementary school in Varaždin. In addition, written consent for using the instrument Young Children’s Computer Inventory – YCCI [9] was obtained from the authors.

2.2. Instruments

1. Young Children’s Computer Inventory (YCCI-v.5.14) [9] intended for assessing attitudes towards computer usage [7]. The inventory consists of 7 subscales. There are 51 items with multiple choice questions: 1. Computer Importance (“perceived value of significance of knowing how to use computers”); 2. Computer Enjoyment (“amount of pleasure derived from using computers”); 3. the Motivation subscale (“unceasing effort and perseverance”) – 5 items; 4. the Study Habits subscale (“mode of pursuing academic exercises within and outside class”) – 6 items; 5. the Empathy subscale (“a caring identification with the thoughts or feelings of others”) – 9 items; 6. the subscale intended for self-assessment of Creative Tendencies (“inclinations towards exploring the unknown, taking individual initiative, finding unique solutions”) – 13 items and 7. the Attitudes Towards School subscale (“perceived value or significance of school”) – 4 items.

Alpha reliability (α) for all the 51 items of the YCCI-v.5.14 questionnaire obtained in this research is 0.668. The highest alpha coefficient
of reliability equals 0.728 for the Creative Tendencies subscale, 0.668 for the Attitudes Towards School subscale, then 0.664 for the Empathy subscale, whereas the alpha coefficient of reliability for the Computer Importance subscale equals 0.635 and that for the Computer Enjoyment subscale 0.468. Other subscales – Motivation and School Habits – have lower coefficients of reliability. These lower correlations may result from a relatively small number of items in the subscales, as well as the fact that the respondents are first-graders who have barely started to develop their study habits and initial motivation for acquiring educational content.

2. Pre-school/School Children’s Questionnaire (D) (authors Kirinić and Vidaček-Hainš) in [6], [20] and [21]).

The questionnaire is intended for assessing the level of information literacy and consists of 53 questions covering computer literacy as well as certain aspects of library and media. Students give their answers by circling one of the given options or suggest their own answer. Questions are mainly picture-based so as to suit the students’ cognitive functioning level best. The survey was conducted by the teachers, who also entered the students’ answers into the protocol. Questions concerning computer literacy were included to assess the children’s command of basic computer skills, their awareness of the purpose of using computers, the ability to recognize and name certain parts of the computer (mouse, keyboard, monitor, printer etc.). Other points assessed included their ability to use Windows operating system commands by media and mouse manipulation, their familiarity with special keys on keyboards, web usage, using a search engine etc. The obtained alpha reliability for the entire “Pre-school/School Children’s Questionnaire D” equals $\alpha=0.678$.

3. Results

a) Preferences and possibilities concerning the acquisition of knowledge through particular information literacy sources

To gather information on which activity (or information source) the students prefer, the following question was asked: Which would you rather do – read a book, write, watch television or use a computer? [7]. The respondents expressed their preferences by circling one of the activities in each pair of options (6 possible pairs obtained by combining 4 basic activities). The distribution of answers is shown in Fig. 1. It is evident that the most preferred activity is reading a book, followed by writing, using a computer, and, lastly, watching television.

A comparative analysis of results obtained from first-graders and those obtained from one-year-younger pre-school kindergarten children (aged between 5.5 and 6.5) yields interesting findings. The kindergarten children prefer TV as the main source of information, the second most preferred activity being reading picture books / books, and the third using a computer [6]. The differences in preferring computer as a source of information literacy is statistically significant for these two children’s groups: children attending pre-school kindergarten programmes and primary school children ($t=13.619, df=83, p<0.01$). The primary school children's preference toward using a computer (M=2.219, sd=1.351, N=64) is thus statistically significantly higher compared to that in one-year-younger pre-school kindergarten children. (M=2.024, sd=1.362, N=84) [6].

It should be noted that even this relatively minor age difference (1 year), as well as the transition from a pre-school to a primary school institution result in increased motivation for using computers, triggered by the recently developed reading and writing skills [18].

![Figure 1. Which would you rather do?](image)

Legend:
Category (x) axis – activity (information source)
Category (y) axis – number of preferences

Besides preferences toward using a particular medium, the first-graders’ perception of the importance of particular media in the process of learning was to be assessed as well. Here the answers were obtained in the same way as in the previous question, the results of which are shown in Fig. 1. The following question was asked: Which information source would you learn more from? [7]. It is evident from the results that in the answer to this question most students opted for “reading a book” (N=169, 44.010%), followed by “writing” (N=105, 27.343%) and “using a
Table 1. Correlations between subscales Young Children's Computer Inventory Questionare

<table>
<thead>
<tr>
<th>N=64 respondents</th>
<th>Computer importance</th>
<th>Computer enjoyment</th>
<th>Motivation</th>
<th>Study habits</th>
<th>Empathy</th>
<th>Creative tendencies</th>
<th>School attitudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer importance</td>
<td>1.000</td>
<td>0.445**</td>
<td>0.341**</td>
<td>0.463**</td>
<td>0.182</td>
<td>0.279*</td>
<td>-0.071</td>
</tr>
<tr>
<td>Computer enjoyment</td>
<td>1.000</td>
<td>0.465**</td>
<td>0.377**</td>
<td>0.322**</td>
<td>0.318*</td>
<td>0.087</td>
<td></td>
</tr>
<tr>
<td>Motivation</td>
<td>1.000</td>
<td>0.475**</td>
<td>0.317*</td>
<td>0.423**</td>
<td>0.177</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study habits</td>
<td>1.000</td>
<td>0.245</td>
<td>0.489**</td>
<td>0.145</td>
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<tr>
<td>Empathy</td>
<td>1.000</td>
<td>0.395**</td>
<td>0.319*</td>
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<td>Creative tendencies</td>
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<td>School attitudes</td>
<td>1.000</td>
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<td>1.000</td>
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</table>

Legend: **Correlation is significant at 0.01 level, *Correlation is significant at 0.05 level

computer” (N=94, 24.480%). TV, as the least preferred source of information for learning, was only ranked fourth (N=16, 4.156%).

Thus, although first-graders assess that reading and writing are the most useful ways of learning, it should be noted that children aged 7 assess that computers can be also useful in acquiring new knowledge.

In their experience, computers are not only used for playing, but also for learning, which is different compared to the results obtained in the other research from pre-school children aged 5-6, who assessed the computer’s primary function to be playing, with knowledge acquisition, communication etc. coming second [6].

b) Assessment of computer importance and computer enjoyment as related to factors of learning success and social functioning (motivation, habits, empathy, creativity, attitudes towards school)

To make it possible to compare results obtained from the subscales of Questionaire YCCI-v.5.14 [9], intercorrelations between the subscales were calculated based on their gross results. The results are shown in Table 1. The majority of subscale intercorrelations are statistically significant. An example of such statistically significant correlations are positive correlations between the results of the subscales computer importance and computer enjoyment (r=0.445, p<0.01). These results are in line with the research by Knezek at al. [10], in which a positive correlation was also obtained between the results from computer importance and creativity subscales (beta=0.31, p<0.001). Our results indicate a statistically significant positive correlation between the computer attitude subscale importance and enjoyment) and other learning success factors. The results on the empathy (feeling the emotions of others) subscale are statistically correlated with the variable computer enjoyment, which indicates the importance of socialization agents in forming attitudes towards computers (r=0.322, p<0.05). In this research, no statistically significant correlation between the results on the attitudes towards school subscale and attitudes toward computer importance and computer enjoyment were obtained. This may be explained by the fact that the respondents in this research are first-graders who have barely started to develop their attitudes towards school.

c) Assessment of the level of information / computer literacy as related to gender

To determine whether there are any gender differences in the level of the acquired information literacy, an instrument for assessing information literacy in pre-school and early school children was used – Pre-school children’s Questionnaire (D) (authors Kirinić and Vidaček-Hainš) in [6], [20] and [21]). The children were given questions on their familiarity with hardware and software.

Defining the Familiarity With Hardware subscale was based on questions related to recognizing and naming particular parts of the computer (mouse, keyboard, monitor, printer etc.). To verify whether the boys or the girls have higher information literacy, and technology
literacy (familiarity with hardware) in particular, gender difference significance was tested by means of a t-test. The results showed that the boys are statistically significantly better at familiarity with hardware (M male=18.342, sd Male=2.141, N male=35) compared to the girls (M female=15.517, sd female=2.458, N female=29). The t-test equals t=4.91, df=62.

Questions related to assessing the familiarity with software and the usage of the operating system and the Internet focused on the precise recognition and naming of the Windows operating system commands (save, print, shut down) as well as recognition of keyboard functions (backspace, escape etc.) and browsers (Google). The results showed that the boys are also statistically significantly better at familiarity with software (M male=23.543, sd male=1.915, N male=35) compared to the girls (M female=21.138, sd female=2.356, N female=29). The t-test equals t=4.506, df=62).

Variations in definition information literacy in six and seven year old children plus differences in their general knowledge of computers place limitations upon the outcome of this research.

4. Conclusion

The results of the research show that children entering primary school already perceive the computer as an important source of information, while expressing enjoyment using a computer. Besides, students who are creative, motivated to learn and develop their study habits also perceive a higher importance of using a computer (computer importance) and prefer to use it (enjoyment). Such findings call for development of computer-based educational content intended for developing creativity, with the emphasis on encouraging creativity development in students demonstrating higher school achievement and motivation, and better developed study habits.

Taking into account the specific features of this age group, it is necessary to provide a satisfactory level of coordination between computer literacy and computer attitude in the wider context of education or a particular school (school attitude) [19].

First-graders are not only familiar with ways of using computers, but they are also able to name the main hardware and software components (as was previously shown in [5]). McNair, Kirova-Petrova and Bhargava [11] point to gender differences in ways of using computers and selecting computer content, which is another factor to consider in introducing information technology into the education system, of particular importance to Informatics teachers.

Furthermore, all the aforesaid considerations are in line with the propositions presented in [5], i.e. the five propositions emerging from a synthesis of other research into the use of technology with preschool kindergarten through grade three students. First, the appropriate use of technology affords young children opportunities for socialization and language development. Second, developmentally appropriate software infused with the current curriculum encourages children to explore, use their imagination, and solve problems. Third, technological tools enhance the development of attention span in young children. Fourth, young children with special needs benefit from multiple uses of technology. Last, the role of the classroom teacher and the learning environment determine how effectively the technology, special tools, curriculum and standards support children’s learning.

A good approach to the Informatics curriculum for first-graders [15] is introducing the computer as a friend that is “there to help, not to be afraid of”, as “a friendly assistant that needs to be told what to do, not only by words, but also by movement”, that we “will learn how to approach, awaken and motivate so as to be surprised by it”. Computer functionality is emphasized by the fact that “it can write and draw for us, and can be used for playing as well”.

Such findings highlight the importance of the computer at the very early stages of education, which in its turn calls for additional training of teachers on how to integrate computers into their teaching, thus expanding computer usability beyond its entertainment function. Useul further research would be to investigate the relationship between, on one hand, the attitudes of parents and teachers regarding computer use and, on the other hand, the attitudes of children regarding the importance of computers and the enjoyment they experience from using them.

5. References


