'I like computers but my favourite is playing outside with my friends': Young children's beliefs about computers

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Abstract
This exploratory study investigated young children's beliefs and opinions about computers by actively involving children in the research project. Fifty two children, four to six years old, were asked a set of questions about their favourite activities and their opinions on computer use before and after a seven month computer intervention implemented by the researcher and two more teachers. Results are differentiated in terms of intervention and non-intervention group and children's computer access at home and at school. Findings suggest that young children like using computers very much but not more than other popular activities. More positive opinions and attitudes for children in the intervention group and less positive attitudes for children who used computers only at home were identified. Implications for further research and for both teachers and parents are highlighted.

Keywords
Computers, technology, integration, young children, early childhood

Introduction

This paper discusses findings of a study which explored young children's attitudes and beliefs towards computer use. The rise of home and school computer access is growing steadily. According to the Australian Bureau of Statistics (ABS, 2006; 2011) 66% of households with children aged from birth to 14 years had a computer at home in 2006 and that percentage rose to 90% in 2011. Despite the rise in the number of households using computers, children's and especially young children's beliefs have not been investigated sufficiently. Reasons for not researching children's views include methodological restraints, absence of rigorous measures and tests and other challenges (Allan & Ainley, 2000; Fleer, 2000; Guay, Marsh & Boivin, 2003).

The study supports the view that listening to children's voices is pivotal in early childhood research (Mac Naughton, Rolfe & Siraj-Blatchford, 2001);accordingly, the study was designed to provide the opportunity for young children to express their views about computer use. The research question was: *What are children's attitudes and beliefs about computer use?* The researcher was interested in how these attitudes and beliefs may be altered (or not) after engaging children with technology in a developmentally appropriate manner. Children were involved in the investigation process by participating in a computer intervention for seven months and also by replying to specific questions, before and after the intervention, as will be revealed in the research design section. This study was part of a larger project which focused on young children's computer use and the possible associations with their self-esteem and involved children, teachers and parents.

Literature review

The importance of using computers

There are a large number of studies reporting the positive impact that the use of computers has on children's academic-cognitive-intellectual growth (Attewell, Belkis, & Battle, 2003; Clements, 2002;

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Marsh, 2004; Stephen & Plowman, 2003a; 2003b; Yelland, 2001; 2002). Using computers has been found to encourage risk taking, problem solving and types of questioning that challenged children's thinking (Downes, 2002). Researchers have also concluded that computer use supports the enrichment of vocabulary and the improvement of oral expression and verbal communication (Brooker & Siraj-Blatchford, 2002; Clements, 1997; Feldman, 2004; Haugland, 2000). Additionally, the use of computers is believed to improve sight recognition of key words for reading ability (Lewin, 2000) and could also assist in learning mathematics more effectively (Filipaki, 2000; Masters & Yelland, 2005; Saridaki & Mikropoulos, 2000).

Research in the social-emotional arena has focused mainly on topics including computer use and cooperative learning, collaboration, peer/teacher interactions, and gender equity issues (Brooker & Siraj-Blatchford, 2002; Feldman, 2004; Freeman & Somerindyke, 2001; Heft & Swaminathan, 2002; Lau, 2000; Wartella & Jennings, 2000). The majority of research identifies benefits in the social development of preschoolers such as cooperation, patience, turn-taking, asking for help and waiting for directions.

Research on attitudes and beliefs about computers

Apart from investigating possible benefits in children's development from computer use, a focus has also been centred on detecting the attitudes children have towards computers. An early study on young children's attitudes towards computers was completed by Hyson in 1985. Starting by interviewing 37 preschoolers (four years old), using visual aids, including pictures of people, computers and other toys, Hyson (1985) concluded that children's concepts and attitudes towards computers were positive (informal set up of the classroom, free choice of software and teacher's encouragement also contributed). Those attitudes were '…marked by interest uncomplicated by either awe or anxiety…and their sense of competence as computer users' (1985 pp. 26-28). A subsample of preschoolers was interviewed again after several months of direct involvement with computers and they displayed among other things, '…an increased sense of personal control over the computer' (Hyson, 1985, p. 17). The sense of controlling the machine is often included among the advantages of using the computer as reported by similar studies. Being in control, when using computers is believed to help children build up their confidence (Chang, 2001; Morrison, 1998). However, asking young children directly about these feelings of control when they use computers and whether they feel confident in their use is a topic insufficiently explored.

Hyson's research findings are corroborated in a study completed by Primavera, Wiederlight & DiGiakomo (2001). The main difference was that the participants of that study, although preschoolers, belonged to a population of children coming from 'low income' families. The investigators were trying to examine the 'digital divide' between children who come from high and low income families. Almost 300 preschoolers participated in the study for one academic year (2000-2001). Children were randomly assigned to two classrooms, where computers were utilised as one of the several 'learning stations' available. The difference was that one class followed the 'traditional access' to computers receiving basic access and training, while the other, 'the mentor mediated instruction class', received weekly computer training by a specialist (an undergraduate technology trainer). The researchers administered three tests to children: the School Readiness Skills; the Computer Knowledge Scale; and the Children's Computer User Assessment Scale which evaluated children's technology skills and attitudes. The study's results were indicative of the positive attitudes that children showed during their involvement with computers: very little anxiety, increased self-esteem and confidence, independence, cooperation, creativity, concentration, willingness to try new things and positive peer relationships. However, the researchers emphasised

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that 'providing children with mere access to computers is not enough'. Children who received weekly mentoring 'displayed significantly greater gains in all areas' (Primavera et al., 2001, p. 20). An intervention was part of this study, and children's opinions were examined but not compared with other activities.

Similar results were reached in a UK study the same year, undertaken by Mumtaz (2001). The researcher with the use of questionnaires investigated the computer use of 322 older children (year 3 and 5). The questionnaires included descriptive information (frequencies of computer use in the home and school), but also 16 Likert-type statements on attitudes (self-confidence, liking of computers) and responses describing scenarios of happiness, boredom or anger when working at the computer at home and at school. Mumtaz postulated that children of that age enjoy using computers at home more than at school. She found no significant differences in children's self-confidence. The same researcher suggested that children are more happy and satisfied when playing games on the home computer while extremely bored with certain activities at school (for example word processing). Summarising, the participants of this study were older children, and connections with younger children could not be insinuated but it underlines the need for further exploring the 'appropriate', 'integrated' use of computers at school and also how can attitudes towards computers change over time.

Mumtaz's findings are in line with a recent European study (Netherlands), completed by McKenney and Voogt in 2010. Using the 2007 edition of 'Young Children's Computer Inventory' (Knezek, Miyashita & Sakomoto, 1996) they interviewed 167 children (four to eight years old) about their attitudes towards computers. They also explored (close ended questions) computer availability, access and activity types and skills to use computer independently. Their participants were from various ethnic and socio-economic backgrounds and had access to computers both at home and at school. The researchers concluded that children primarily use computers for playing games and they hold positive attitudes towards computers. However, no intervention was implemented to facilitate comparisons.

The research "gap": children's own attitudes

In contrast to the widespread use of technology, limited research exploring young children's attitudes towards computers exists. The lack of research around this topic is even more profound where young children, under six years of age, are concerned as highlighted in the previous section. A small number of studies (Hyson, 1985; McKenney & Voogt, 2010; Mumtaz, 2001) involved young children's opinions or an intervention in their research design. Implementing an intervention is useful in facilitating comparisons between groups. Moreover, existing research findings indicate that children hold positive attitudes towards computer use but children's preferences were not compared with other popular activities.

Attempting to add useful insights in this field, by involving children in the process, implementing a computer intervention and by comparing computers with other popular activities, was the aim of this small-scale study. The next section will elaborate on the methodological elements adopted.

Method

Only a part of a larger exploratory project is presented in this paper. The project explored the association of children's computer use and their self-esteem. This paper addresses one of the main research questions of the project which was to identify children's attitudes towards computers before and after a seven month computer intervention.

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Participants and sample selection
The participants of the project were 52 children (44 months to 79 months of age, *M* = 58.71, *SD* = 8.49), their parents (one parent in each family - usually the mother) and their teachers (*n* = 5). The sample included children who did and did not have computer access at home. In this paper, we concentrate on data from children (*n* = 52).

The selection of children was not random, but involved 'purposive' and 'convenience' sampling (Gay & Airasian, 2003; Jonassen, 2004). The sampling was purposive and 'convenient' in respect that schools/preschools (one primary school and two child care centres in Metropolitan Melbourne) were chosen on basis of teachers willing to participate in computer intervention and ease of access by researcher. Children and parents were included on the basis of being willing to participate.

Fifty-two children were allocated to one of the intervention or non-intervention subgroups (explained below) in discussion with teachers and parents. Children were as alike as possible in terms of demographic variables, such as age, cultural background and parents' economical and educational status.

The **'intervention group'** comprised of 24 children divided in two subgroups:

1) The *Int_pre* group (intervention – preschool)*:* 12 children attending preschool age 44 to 59 months old (*M* = 52.08, *SD* = 4.94)
2) *The Int_sch* group *(*intervention – school*):* 12 children attending prep class (compulsory year prior to Grade 1) in a primary school, 60 to 73 months old (*M* = 65.08, *SD* = 4.07).

The '**non-intervention group'** comprised of 28 children divided in three subgroups:

1) The *Non-Int_pre1* group *(*non-intervention - preschool first sub-group*):* eight children of preschool age, 46 to 61 months old attending the same preschool as the intervention preschool group (*M* = 52.63, *SD* = 5.85);
2) The *Non-Int_pre2* group (non-intervention - preschool second subgroup): nine children from a different preschool, 50 to 58 months old, with no access to computers at home or at school (*M* = 52.56, *SD* = 2.74); and
3) The *Non-Int_sch* group (non-intervention school): 11 children attending prep class in the same primary school as the intervention group, 63 to 79 months old (*M* = 68.45, *SD* = 4.80).

There were 32 boys and 20 girls in the study. This gender imbalance was beyond the researcher's and the teachers' control as almost all the classes had more boys and also because of the gender of children for whom parents gave their consent

Children's parents and five teachers: two preschool teachers, two prep class teachers and one was the school's IT teacher, were also involved in the study. However, as noted above, this paper focuses on children's data.

Data collection tools

Research that aims at exploring topics about children is useful and probably imperative to 'utilise' children's views and participation to a certain extent. The challenge with educational research and young children is to find the right ways and appropriate tools for 'testing' children (Clark, 2004). It

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should not be avoided to involve children in the research process just because it is difficult or requires special consideration. Following the easy way of just involving adults who know or work with children (Measelle, Ablow, Cowan, & Cowan, 1998) is not always the appropriate one. The richness and depth of information acquired would not be the same as investigating the primary source – children.

In line with the above considerations, the researcher reviewed the relevant literature and created a set of close-ended and open-ended questions utilising visual prompts, such as pictures where appropriate (for example: for the questions of what was children's favourite activities at home and at school). This set of questions, discussed in this paper, was the first part of a computer self-esteem test administered individually to all children twice by the researcher, before and after the intervention. The use of the questions with each child lasted from 17 to 20 minutes and was audio recorded.

The tests were scheduled in consultation with the classroom teacher. The pre-intervention test took place two months after the commencement of the school year, to allow children time to adjust to their new environment and teachers. The post-intervention test took place one month before the end of the school year. The tests were conducted usually in a quiet place in the class, or somewhere else in the school that was very familiar to children, as recommended by the literature (Fraser, 2004; Greig & Taylor, 1999; Mac Naughton, Rolfe, & Siraj-Blatchford, 2001; Wilson, Powell, & Freeman, 2002).

All participants of the study were informed of the basic aims of the research and written consents were given to the researcher from principals, teachers, and parents. Children were also informed about the test and the intervention and were free to withdraw from the research if they wanted to at anytime. Children, who did not participate in the computer intervention, did not make any complaints at any time and the decision not to include them was made after discussion with their teachers and parents.

The computer intervention

In order to explore children's computer use, a program of 32 computer activities (four different software – eight activities for each one) was designed by the researcher (the 'intervention') based on the literature, previous experiences with technology and young children but also on availability and usability of software for young children. The intervention was implemented by the researcher and two of the participating teachers. Preschool children participated in the intervention twice a week for 20-30 minutes each time (*Int_pre* group) and preps participated once a week - 45 minutes (*Int_sch* group). The intervention lasted for seven months.

The main aim of the computer activities was to introduce and familiarise children with the new technology in a holistic way. According to the research around computer education, a very good way to use computers is through the 'integration' of computers in the daily program (Brooker, 2003; Sheridan & Pramling-Samuelson, 2003).

Computers should be treated as 'tools' and used to enhance learning experiences and support educational process (Clements, 1997; Downes, Arthur, & Beecher, 2001; Hawthorne, 2002; Resnick, 1998; Wardle, 2002). Following also the National Association for the Education of Young Children (NAEYC) guidelines (2002; 2012) for implementing computers in early years education, the computer was 'one more centre' in the preschool class and the extension of curriculum areas was attempted. For example, if the aim was for preschoolers to learn the basic shapes, the teacher

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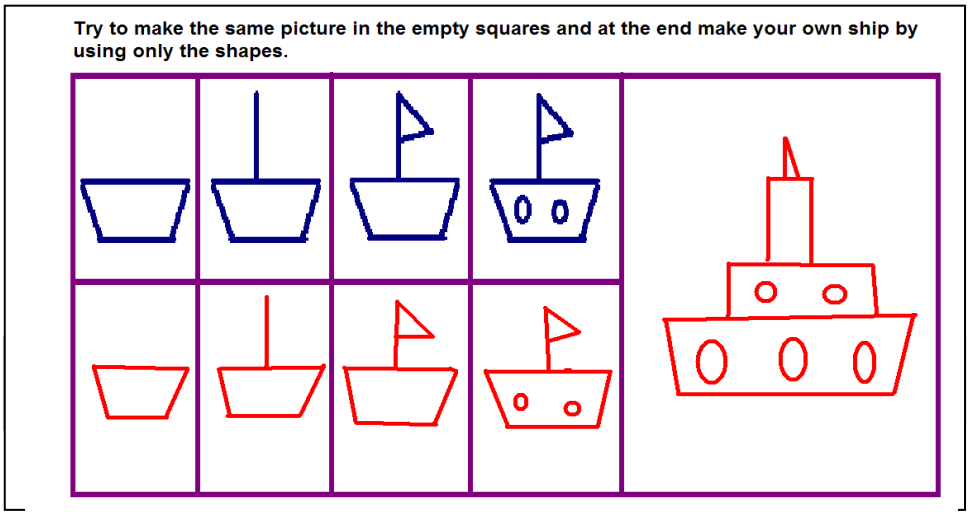
could implement an activity on the computer where children could practice drawing shapes with a software such as Paint (Figure 1).



An example of an 'open-ended' computer activity created by the researcher

Instructions and the activities for all programs were carefully planned by the researcher. To minimize the effects of differences in the delivery of the activities, the two teachers (a preschool teacher and the primary school IT teacher) assisting with implementing the intervention were informed about the activities in advance. These teachers were also informed about the integrated way of implementing computers and their vital role to the whole process. They were given lesson plans, examples and instructions to follow for each computer activity (eight activities for each software) in written and in an electronic form. The researcher had daily contact with the preschool teacher and very regular contact with the IT primary school teacher to help them with any difficulties arising or any misunderstandings in the implementation of the computer activities, and to ensure consistency of delivery.

The software

The computer intervention consisted of two kinds of educational software: 'open-ended' and 'close-ended'. The educational software were carefully selected based on the researchers' experience and knowledge with teaching using these software, their popularity in preschool classrooms (Yelland, 1999), their educational targets and importantly their availability and the ease with which they could be implemented by the other teachers who knew how to use a computer but had not used these software before.

The 'open–ended' software was selected as it gives children the opportunity to explore, experiment, create new things, make choices and then find out the impact of their own decisions (for instance, they have to decide what a birthday card will look like for one of their friends or what kind of picture they can make by using only geometrical shapes). In this intervention two 'open-ended' programs were used, Microsoft's 'Paint' (2000) and 'Kid Pix Deluxe 4' (Learning Company, 2004).

In using 'close-ended' software the aim for children was mainly to learn to explore the software, improve their mouse control and at the same time also benefit from completing the program's educational activities (for example, a memory game with cards). The researcher could also assist

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children exploring activities from the software that supported what they were learning in terms of their school curriculum. For example, when preschoolers were learning about animals, there were activities in the program about finding the right habitat for animals. Two 'close-ended' software were utilised, 'Adiboo, I can read, I can count' (Knowledge Adventure, 1996) and 'Putt-Putt, joins the circus' (Humongous Entertainment, 2001).

Results
Children's responses were coded and grouped under emergent categories (for example children's responses about knowing the letters/numbers were grouped under the category: 'academic skills'). To identify similarities and differences between intervention and non-intervention groups, between pre- and post-intervention periods, and computer access at home, descriptive statistics (frequencies and percentages) of all responses were examined using SPSS.

Activities related questions

Intervention and non-intervention group
Responses to questions about children's *favourite* activities at home and at school, activities they believed they were '*very good at'* and '*not very good at'* were analysed to identify emerging categories (Table 1) for children in pre- and post-intervention.

Importantly, computers were not children's most frequently reported favourite activity at home or at school. Rather, they were children's second most frequently reported favourite activity at home and their fourth (pre-intervention) or third (post-intervention) most frequently reported favourite activity at school. Sports and playing outside with their friends was most frequently reported as children's favourite activity at home both at pre and post intervention (n = 23; n = 31, respectively).

However, when comparing the two groups (intervention and non-intervention) higher percentages of children who participated in the intervention nominated computers as their most frequently reported favourite activity in comparison to the non-intervention groups in both periods (Table 1). The percentage of children in the intervention group who nominated computers as their favourite activity at home and their favourite activity at school was the same, whereas percentages decreased in post-intervention for computers as the favourite activity at home and increased for computers as the favourite activity at school for the non-intervention group.

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Table 1: Children's responses to activities related questions by intervention and non-intervention group in pre- and post-intervention

	Intervention (n = 24) Percentage (%) Number of children (n)		**Non-Intervention (n = 28)**	
Questions - responses	**Pre**	**Post**	**Pre**	**Post**
Favourite activity at home: 'computers'	29.16 (7)	29.16 (7)	25.00 (7)	14.28 (4)
Favourite activity at school: 'computers'	29.16 (7)	29.16 (7)	7.14 (2)	14.28 (4)
Activities they were very good at: 'computers'	16.66 (4)	33.33 (8)	10.71 (3)	14.28 (4)
Activities they were not very good at: 'computers'	16.66 (4)	0.00	10.71 (3)	17.85 (5)

The percentage of children in the intervention group who believed they were '*very good at*' computers doubled in post-intervention (from 16.66% to 33.33%), while the percentage of children from the non-intervention groups increased slightly (from 10.71% to 14.28% - Table 1).

Consistent with this finding were the responses to the opposite question, activities children were '*not very good at*', where computers were not nominated by any of the children from the intervention groups in post-intervention. Conversely, a higher percentage of children from the non-intervention groups post-intervention compared with pre-intervention named computers as the activity they were '*not very good at*' (10.71% in pre-intervention to 17.85% in post-intervention – Table 1).

Computer access groups
Responses to *'activities related questions'* that specifically nominated computers were further differentiated in relation to children's computer access at home and at school (four different access sub-groups: 'home and school', 'school', 'home', 'no' access) for pre- and post-intervention periods.

The differentiation of results in terms of computer access revealed noticeable differences. Results imply that more computer access was related to positive attitudes towards computers. Children with computer access at 'home and school' and only at 'school' showed increases in the percentages of almost all their responses related to 'computers'. At the same time, children who had computer access only at 'home' showed decreases in the percentage of responses nominating 'computers' (in all the ' activities related questions') and children with 'no' computer access showed stable results in post-intervention (Table 2).

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Similarly, there was an increase in the percentage of children with computer access at 'home and school' and only at 'school' who reported computers as an activity they were '*very good at*' and a decrease in the number who nominated computers as an activity they were '*not very good at'*. In comparison, there was a decrease in the percentage of children who had computer access at 'home' who nominated computers as an activity they were '*very good at*' and an increase in the number of the same group who nominated computers as activity they were *'not very good at'*.

Table 2: Children's responses to activities related questions by computer access and by intervention and non-intervention group in pre- and post-intervention

Questions – Responses	Home and School (n = 22)				School (n = 13)				Home (n = 8)		No computer (n = 9)	
	Int (n = 16)		Non-Int (n = 6)		Int (n = 8)		Non-Int (n = 5)		Non-Int		Non-Int	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Favourite activity at home: 'computers'	37.50 (6)	31.25 (5)	0.00	16.66 (1)	12.50 (1)	25.00 (2)	20.00 (1)	0.00	25.00 (2)	12.50 (1)	44.44 (4)	22.22 (2)
Favourite activity at school: 'computers'	31.25 (5)	31.25 (5)	16.66 (1)	16.66 (1)	25.00 (2)	25.00 (2)	0.00	20.00 (1)	12.50 (1)	12.50 (1)	0.00	11.11 (1)
Activities they were very good at: 'computers'	12.50 (2)	37.50 (6)	16.66 (1)	16.66 (1)	25.00 (2)	25.00 (2)	0.00	40.00 (2)	12.50 (1)	0.00	11.11 (1)	11.11 (1)
Activities they were not very good at: 'computers'	18.75 (3)	0.00	0.00	0.00	12.50 (1)	0.00	20.00 (1)	20.00 (1)	0.00	25.00 (2)	22.22 (2)	22.22 (2)

Computer use related questions

Intervention and non-intervention group

Children were asked specific questions related to computer use: if they liked using computers and for what reasons; what was their favourite computer program (software); what things they thought computers could teach them; whether computers could make them cleverer; and help them have more friends. The responses to these '*computer use related questions'* for all children participating in this study in pre- and post-intervention are presented in Tables 3 and 4.

For the question '*why do you like using computers'*, six main response categories emerged. '*Entertainment'* included any comment from children about '*fun'*, '*play'*, and '*having good time'*. '*Social reasons'* included comments about their friends or other people with whom children liked to use the computer with. In the category, *'self reasons'* responses such as, '*because I am very good at it*', '*because it is easy for me*' were included.

The most frequently reported reason provided by children to the question why they liked using computers was '*entertainment'* and the number of children providing that response increased in post-intervention.

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Table 3: Children's responses to computer use related questions by intervention and non-intervention group in pre- and post-intervention

Questions - responses	Intervention group ($n = 24$) Percentage (%) Number of children (n)		Non-Intervention group ($n = 28$)	
	Pre	Post	Pre	Post
How much they liked using computers: 'very much/great deal'	91.66 (22)	91.66 (22)	89.28 (25)	75.00 (21)
Why did they like using computers?				
Academic reasons	20.83 (5)	16.66 (4)	7.14 (2)	3.57 (1)
Don't know	8.33 (2)	0.00	7.14 (2)	10.71 (3)
Entertainment	70.83 (17)	83.33 (20)	64.28 (18)	64.28 (18)
Love it	33.33 (8)	0.00	39.28 (11)	0.00
Self reasons	12.50 (3)	8.33 (2)	32.14 (9)	10.71 (3)
Social reasons	8.33 (2)	0.00	7.14 (2)	0.00
Other (two missing answers from the non-intervention group)	8.33 (2)	20.83 (5)	0.00	28.57 (8)
What could computers teach them?				
Academic skills	66.66 (16)	62.50 (15)	46.42 (13)	42.85 (12)
Art skills	16.66 (4)	25.00 (6)	17.85 (5)	7.14 (2)
Don't know	16.66 (4)	0.00	32.14 (9)	10.71 (3)
Games	20.83 (5)	20.83 (5)	17.85 (5)	21.42 (6)
Other	0.00	8.33 (2)	3.57 (1)	28.57 (8)
Could computers make them cleverer? : 'yes'	83.33 (20)	95.83 (23)	82.14 (23)	82.14 (23)
Could computers help them have more friends? : 'yes'	75.00 (18)	54.16 (13)	64.28 (18)	75.00 (21)
Which program was their favourite?				
Close-ended	62.50 (15)	0.00	46.42 (13)	21.42 (6)
Open-ended	16.66 (4)	0.00	7.14 (2)	7.14 (2)
Play station	16.66 (4)	0.00	35.71 (10)	39.28 (11)
Open-ended from the intervention				
Close-ended from the intervention		100.00 (24)		

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The second most frequently reported reason for liking computers in pre-intervention was '*because I love it'*. In post-intervention the second most frequently reported reason for liking computers was '*other'*. The different responses in this category '*other',* mostly related to what computers enable children to do such as: '*Because of the Internet', 'Because I have a new one', 'My dad taught me to like the computer', 'I can do different things on the computer', 'I have never been on the computer', 'I can play fighting games', 'I can play music games', 'You do what the teachers say', 'I like painting/drawing'*. No significant patterns to these responses were evident when differentiated on the basis of intervention and non-intervention groups and computer access.

The frequency of responses to '*computer use related questions'* remained fairly consistent for intervention and non-intervention groups. Most noticeably there was a stable result post-intervention for intervention children reporting that they liked using computers *'very much',* an increase in the percentage of children responding that they liked using computers for '*entertainment'*, that computers could teach them '*art skills*' and that computers could make them '*cleverer'*.

There were noticeable differences (decreases) for the non-intervention group in the percentage of responses related to liking computers for '*self*' reasons and computers teaching them '*art skills'*. While a lower percentage of intervention group children thought computers could help them '*have more friends*, there was an increase in this response for the non-intervention group.

In pre-intervention some children in each group when asked why they liked using computers, gave the simple response '*because I love it'*. No child gave this response in post-intervention. More specifically, all intervention children in post-intervention could provide a response to '*why they liked using computers'* and could also provide a reason to '*what computers could teach them' (*Table 3). In contrast, the number of non-intervention children who gave a '*don't know'* response to the question why they liked computers increased in post-intervention, while at the same period three non-intervention children (10.71%) did not know what computers could teach them.

As identified in Table 3, four main categories and a fifth category '*other'* emerged from responses to the question '*what can computers teach children'*. In both periods children most frequently gave responses related to '*academic skills'* such as, learning the letters or the numbers. Apart from '*don't know'* (decreased significantly in post-intervention) the next most frequently reported responses in both periods related to '*games'* and '*art skills'*.

Similar to why children liked using computers, children's responses categorised as '*other'* to what computers could teach them increased in post-intervention. These responses were: '*I can do work when I get bigger like my daddy', 'I can fix it', 'Anything I want' (*by 2 boys)*, 'Do stuff', 'Burn cds', 'Playstation games', 'Make me want to eat', 'Fighting', 'How to dance', 'What my daddy and mammy know'*. Interestingly, one of the boys who did not participate in the computer intervention but had computer access at school believed that he had not learnt anything about computers ('*I didn't learn anything*'). The children who provided these '*other'* responses were mostly those who did not participate in the computer intervention (n = 8). Two of these 10 '*other'* responses included reference to their parents, possibly implying in some way that computers were an 'adult-like' activity. Intervention children appeared more aware of the different things computers could 'teach' them (for example there was a lower rate of the *'I don't know'* answer in the intervention group).

Children from the intervention and non-intervention groups most frequently nominated programs that were categorised as 'close-ended' as their favourite (for example popular Disney programs). A

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higher percentage of children in the non-intervention group nominated '*playstation'* as their favourite program compared with those in the intervention group. However, comparisons between the two groups in post-intervention cannot be attempted because all intervention children nominated one of the intervention programs as their most favourite in post-intervention, (one of the two 'close-ended' software).

In relation to the non-intervention children, the '*playstation'* choice was, in post-intervention, children's most frequently reported favourite thing to do on the computer, while the percentage of children's nominating 'close-ended' program as their favourite decreased (from 46.42% in pre-intervention to 21.42% in post-intervention).

Computer access groups

When examining responses to '*computer use related questions'* the most noticeable findings related to the generally stable or increased responses post-intervention for children with computer access at 'home and school' compared with children with less access.

There was an increase in the percentage of intervention and non-intervention children with access at 'home and school' who reported liking computers '*very much/great deal'* (Table 4). The results were stable for the 'school' computer access groups and the 'home' computer access group. There was a slight decrease in the percentage of children in the 'no' computer access group who reported they liked using computers '*very much'*.

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Table 4: Children's responses to computer use related questions by computer access and intervention or non-intervention group in pre- and post-intervention

	Home and School (n = 22)				School (n = 13)				Home (n = 8)		No computer (n = 9)	
	Int (n = 16)		Non-Int (n = 6)		Int (n = 8)		Non-Int (n = 5)		Non-Int		Non-Int	
	Percentage (%) Number of children (n)											
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Questions – responses												
They liked using computers: 'very much/great deal'	75.00 (12)	93.75 (15)	66.66 (4)	83.33 (5)	87.50 (7)	87.50 (7)	80.00 (4)	80.00 (4)	75.00 (6)	75.00 (6)	100.00 (9)	88.88 (8)
Why did they like using computers: 'Entertainment'	68.75 (11)	81.25 (13)	83.33 (5)	83.33 (5)	75.00 (6)	87.50 (7)	60.00 (3)	80.00 (4)	50.00 (4)	75.00 (6)	66.66 (6)	33.33 (3)
What could computers teach them: 'Academic skills'	68.75 (11)	68.75 (11)	66.66 (4)	100.00 (6)	62.50 (5)	50.00 (4)	60.00 (3)	40.00 (2)	37.50 (3)	37.50 (3)	33.33 (3)	11.11 (1)
Could computers make them cleverer? 'yes'	81.25 (13)	93.75 (15)	66.66 (4)	83.33 (5)	87.50 (7)	100.00 (8)	80.00 (4)	80.00 (4)	87.50 (7)	100.00 (8)	77.77 (7)	66.66 (6)
Could computers help them have more friends?: 'yes'	75.00 (12)	56.25 (9)	50.00 (3)	66.66 (4)	75.00 (6)	50.00 (4)	40.00 (2)	40.00 (2)	87.50 (7)	100.00 (8)	66.66 (6)	77.77 (7)
Which program was their favourite? 'Close ended'	62.75 (10)	0.00	50.00 (3)	66.66 (4)	62.50 (5)	0.00	20.00 (1)	0.00	50.00 (4)	12.50 (1)	55.55 (5)	0.00
'Playstation'	18.75 (3)	0.00	33.33 (2)	16.66 (1)	12.50 (1)	0.00	60.00 (3)	80.00 (4)	37.50 (3)	50.00 (4)	22.22 (2)	22.22 (2)

The response rate for 'entertainment' as the reason why children liked using computers increased post-intervention for children with computer access at 'home and school', and at 'school', and for non-intervention children with computer access at 'school' or at 'home' (Table 4). Once again the percentage for that response decreased only for the children who did not have access to computers.

There was a general decrease in the percentages of children nominating 'academic skills' for what computers could teach them. The only increase in post-intervention was noted for children with computer access at 'home and school' who were in the non-intervention group.

The percentages of intervention and non-intervention children with computer access at 'home and school', of intervention children with computer access at 'school', and of the non-intervention children with computer access at 'home' who gave a positive response to whether computers

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'could make them cleverer', increased. The percentages of the 'yes' response to the same question decreased for children with 'no' computer access and remained stable for non-intervention children with computer access at 'school' (Table 4).

A greater percentage of non-intervention children with computer access at 'home and school', only at 'home' or 'no' computer access, responded in both periods that computers '*could help them have more friends'*.

Finally, the percentage of children who reported 'close-ended' programs as their favourite computer program in post-intervention increased only for the non-intervention 'home and school' computer access group. At the same time, '*playstation'* was reported as children's favourite computer program from a greater percentage of children of the non-intervention 'school' computer access and 'home' computer access groups.

Discussion

The current study provided the opportunity for children, who are the direct recipients of advantages and disadvantages from computer use, to articulate their beliefs and reveal their attitudes towards computer use. Differentiation of data facilitated comparisons between groups and also highlighted differences and similarities between children who use computers in an organised, integrated way (computer intervention) and those who are using computers in an unplanned, not integrated way (non-intervention children with computer access only at 'home' or only at 'school').

In answering the research question, results suggest that children who participated in the computer intervention reported more positive attitudes towards computers in post-intervention. The results showed agreement with the results of previous research on children's positive attitudes when using computers (Hyson, 1985; McKenney & Voogt, 2010; Primavera et al., 2001). However, this study adds a new insight when considering that playing with computers is not children's most favourite activity at home or at school. Young children in this study nominated playing sports and playing outside with their friends as their most enjoyable activity. In other words, young children in this study were fond of technology but they were more fond of sport and peer interaction. This finding is significant and requires further attention, especially now that we are witnessing a move into other digital tools, such as tablets.

Findings also suggest that children who were involved in the intervention felt more confident after the seven month intervention period and had not lost their interest in using computers. On the other hand, there was a reduction in the non-intervention children who nominated computers as their favourite activity. Non-intervention children appeared to have lost some of their interest and self-esteem. This finding implies that simply having access to computers does not guarantee the sustainment of interest and enjoyment of using the computer. Other dimensions are important and influence children's engagement with computers and maybe other factors such as the emotional support provided by adults (Ellis & Blashki 2004; Nir-Gal & Klein, 2004) and also the collaboration between teachers and parents (Plowman, McPaKe, & Stephen, 2008; Plowman, Stevenson, Stephen & McPake, 2012; Siraj-Blatchford & Siraj-Blatchford, 2006) can be crucial. Findings suggest that simply having access to computers may stimulate children at first but they will soon lose their enthusiasm. Although adults' role was not part of this study's research questions, reflecting on existing research (Plowman, McPaKe, & Stephen, 2008; Plowman, Stevenson, Stephen, & McPake, 2012) it can be suggested that teachers' and parents' role is vital in

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trying to sustain children's interest for computers. Adults have the ability to design meaningful activities and also help children in solving arising technical problems. If a computer task is very difficult most of the children in this age group will be discouraged or even disappointed. Having an adult (or a peer) to scaffold their learning and show them ways to persist on a task will enhance children's academic and socioemotional development.

The reasons why children liked using computers so much were also identified through children's responses. The main reason for their strong liking was '*entertainment*'. Computers appeal to children because they satisfy the criteria of play as noted in the literature (Brooker & Siraj-Blatchford, 2002; Haugland, 2000; McKenney & Voogt, 2010; Mumtaz, 2001; Wright, 2001; Yelland, 2005). This finding provides strong support for the research community to be engaged in the playful dimension of computer use rather than concentrating only on the learning/academic aspects. Interestingly, while children admitted that they liked computers because they were '*fun*' (*entertainment*) they were also aware of computer's role to teach them 'the alphabet' and 'numbers' (*computer use questions*). However, children did not report the ' academic role' of computers as one of the reasons why they liked using computers. Entertainment seems to matter more for young children than for adults. Teachers and policy makers are the ones that make most of the decisions about what kind of software and activities children are engaged with. Thinking about the 'fun' characteristics computer activities should encompass is vital to allow for a sustained interest and active engagement.

Summarising, intervention children in post-intervention sustained their interest in using computers (in contrast to non-intervention children) but computers were not their most favourite activity. Additionally, intervention children increased their self-esteem in utilising computers, appeared more informed on what they can use the computers for and they were able to articulate specific reasons why they liked using computers.

Limitations

The exploratory nature of this study did not aim at being able to generalise its findings to larger populations. The relatively small and not randomly selected sample does not allow establishing or even insinuating causal relationships or generalisations of the research outcomes. Nevertheless, the researcher recognises the need for conducting research in this topic with larger samples so that any statistically significant differences between experimental and control groups can be facilitated and identified.

Conclusion

Children's positive attitudes and beliefs about computer use were discussed in this paper. The results of this study provide a useful insight into children's beliefs by revealing that children value other activities, such as sports, more than computers. The playful character of computer activities was also found to be fundamental for captivating and sustaining young children's interest in computers.

Investigating children's input about technological implementations is our first step in attempting to foresee what the digital future holds for education. As Negroponte pointed out almost 20 years ago (1995, p. 231):

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> *We are not waiting on any invention. It is now. It is almost genetic in its nature that each generation will become more digital than the preceding one. The control bits of that digital future are more than ever before in the hands of the young. Nothing could make me happier.*

Young children are becoming more 'digital' but at the same time children in this study appeared 'not obsessed' and equally, if not more interested in other 'traditional', non-digital activities. Finding a balance between technological engagements and other activities is a key challenge for educators and families. The amazing expansion of new technologies in all aspects of children's lives is unstoppable and their role cannot be ignored. The focus of future research can be placed on which ways ICT can yield the best results in children's overall development and on how to best incorporate and extend children's home digital interactions and skills.

New ICT tools, such as tablets and mobile devices have made a strong appearance in children's lives. It is almost definite that new tools will be invented every few years. The ways that these new tools can be integrated in an early childhood class is surely to be the focus of future educational research. Exploring children's views on the use of these tools will add useful insights into research as demonstrated in this study. Action research involving teachers, parents and children would be particularly helpful in future research endeavors.

The future is here and now and it is challenging to comprehend the endless possibilities that technology can offer. This study explored young children's attitudes and beliefs towards computers by involving young children in the process successfully. Future research around young children's computer use will be benefited by involving children in the design. Young children in this study were found to possess a good balance between the use of computers and other activities, contradicting adults' concerns that technology dominates children's interests. Moreover, taking children's fascination of computers for granted will not help educators improve their practice. A number of prerequisites are worth considering, such as the development of a holistic, integrated and playful approach to children's use of technology. The use of computers has the potential to contribute to children's learning and overall development only if the tasks are interesting and enjoyable by both the teachers and the students.

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