Young children's access to and use of ICT at home

KLEOPATRA NIKOLOPOULOU*, VASILIOS GIALAMAS*,
MARIA BATSOUTA**

*Early Childhood Education Department
University of Athens
Greece
klnikolopoulou@internet.gr
gialamasbasilis@yahoo.gr

**School Advisor
of Early Childhood Education
Greece
batsoutam@yahoo.gr

ABSTRACT

This paper investigates young children's access to and use of ICT at home. A questionnaire was completed by the parents of 147 children, aged 4-6,5. Young children have access to and use a wide range of technologies at home, involving domestic leisure technologies, electronic toys and computers. The variables gender, age and parents' educational background had an occassional isolated impact on children's use of ICT. More boys than girls use console games and programmable toys-robots. Parents' high educational background was linked to the use of educational software. Implications for early childhood teachers and links between home and kindergarten are discussed.

KEYWORDS

Children, ICT, technology, home, early childhood education

RÉSUMÉ

Ce document examine l'accès des jeunes enfants à l'utilisation des TIC à la maison. Un questionnaire a été rempli par les parents de 147 enfants, âgés de 4-6,5 ans. Les résultats démontrent que les jeunes enfants en ont accès et utilisent un large éventail des technologies à la maison, des technologies de loisirs domestiques, jeux élec-

troniques et ordinateurs. Les variables de sex, de l'âge et du niveau d'éducation des parents ont été isolées, comme ayant un impact sur l'utilisation occasionnelle par les enfants des TIC. Les garçons utilisent plus que les filles la console des jeux et les jouets-robots programmables. Le niveau de scolarité supérieure des parents est lié à l'utilisation de logiciels éducatifs. Les conséquences pour les enseignants de la petite enfance et les liens entre le domicile et l'école enfantine sont également discutées.

Mots-Clés

Introduction

Young children are growing up in a digital world in which they are developing a wide range of knowledge, skills and understanding. Even the youngest children live in a media-saturated world and the magnitude of their technological experiences differs substantially from that of previous generations (Wartella, Vandewater & Rideout, 2005). Lately, the digital divide debate has begun to incorporate issues of home ownership of ICT, especially ownership in households that contain children (Livingstone & Helsper, 2007). Research into kindergarteners' experiences of new technologies / ICT at home is still in the early stages of development, both abroad and in Greece. The age range definitions of *kindergarteners*' vary among different countries, but after the age of six most children in different countries enter primary education (OECD, 2001; Neuman 2005). Research studies reveal that young children aged 3-6,5 years old have access to and use a wide range of media and new technologies at home (Marsh et al., 2005; McPake et al., 2005; Espinosa et al., 2006; Stephen et al., 2008; Plowman, McPake & Stephen, 2008, 2010). In terms of everyday technology, there is an array of electronic and digital equipment that permeates young children's lives and shapes their understanding of the world and this includes digital cameras, computers (including laptops), console games, ICT based 'smart' / interactive toys, programmable robots and televisions (Becta, 2008).

This paper regards an investigation of young children's (who attend kindergarten) access to and use of ICT at home. For the purpose of this paper we use a broad definition of *Information and Communications Technologies (ICT),* beyond desktop computers, to include everyday technologies such as audio-video resources and interactive toys. This is because ICT is embedded in a range of everyday technologies available to young children for use in the home and many products familiarise children with the concept of interactivity, which is a major defining property of ICT. In this paper, the term *ICT* is used as synonymous to the term *technology*.

THEORETICAL BACKGROUND

Empirical evidence about kindergarteners' experiences of ICT in the home reported that young children have access to and use a wide range of media and new technologies at home. Marsh et al. (2005), in England, found that almost all families with young children owned a TV and video/ DVD player and most of them had a computer. 53% of children up to 6 years were using a computer at home (favourite use was to play games on websites or on CD / DVD-ROMs they had purchased) and 48% played console games. Boys were more likely to have console games, while gender differences were found in relation to children's favourite TV programmes and DVD films. A study with 5 year old children in Australia (Straker et al., 2006) showed that nearly all children watched television, more than half of the children (56%) used computers at some time during each week (less than an hour in a day), while console and handheld electronic games were used by 28% and 9% respectively.

McPake et al. (2005), in Scotland, investigated 3-5 year old children's technology experiences in the home. Diaries kept by parents revealed that the most used items were the TV and the computer, but also included electronic books, videos and console / handheld electronic games. Some gender differences were apparent as boys seem to spend more time on ICT related activities than girls, and to use a wider range of items. Children's use of ICT depended on availability and access. Parents, older siblings and other friends/ relatives played a key role in enabling young children to learn to use complex ICT equipment. Some children experienced e-mail and other internet based communication, while the majority of children had experienced of others' taking photographs/ videos of them (the children rarely took photographs themselves). Parents saw ICT to have a range of entertainment and educational purposes as, for example, in supporting literacy-numeracy development and technical competence. Early childhood teachers commented on the greater confidence demonstrated by children who use computers at home, but they tended to consider children's home experinces with ICT qualitatively different from their experiences at kindergarten.

Espinosa et al. (2006) examined the role of technology in the home and its impact on reading and math achievement in the early grades. Their results showed that access to and use of technology influenced children's academic achievement, but mere access was unlikely to be sufficient for all young children to benefit from technology in the home. It was emphasised that adults needed to mediate the use of these potential learning tools for children. DeBell & Chapman (2006) in the USA, found that computer and internet use begin early, even before kindergarten. They reported that in contrast to the 1990s, when boys were more likely than girls to use computers and the internet, overall computer use rates for boys and girls are now about the same.

Stephen et al. (2008) found that most 3-5 year old children were acquiring

competencies with a range of technologies at home and that they enjoyed using both ICT and more traditional toys (ICT did not dominate their preferences). Over two-thirds of the children placed the computer on the 'happy side' and over half made the same decision about television. Computer activities such as drawing and watching DVDs were very popular. The children's preferences suggested that new technologies are a favourite source of entertainment, because using ICT at home was perceived as a leisure or play activity. Family values, orientations and expectations influenced spending decisions and the rules for engaging with new technologies in the home. The role of adults (and other children) and of family values-practices in supporting 3 and 4 year old children's learning with technology at home was shown by researchers (Plowman, McPake & Stephen, 2008). Preschool children had acquired basic levels of competence in different areas of learning with technology at their home (acquiring operational skills, developing dispositions to learn etc) by the time they were ready to start school (Plowman, McPake & Stephen, 2008, 2010).

Research studies (Anand & Krosnick, 2005; Straker et al., 2006) found that various socio-economic / demographic factors (e.g., socio-economic status of families, parental education and ethnicity) and child characteristics (age and gender) were linked to children's access to and use of ICT at home. For example, Anand & Krosnick (2005) examined demographic predictors of media use among young children (1 to 6 years old) at home. It was found that children's age, race and parents' education had significant effects across most types of media use, whereas children's gender, languages spoken at home and parents' employment status and age had only occasional, isolated effects. Straker et al. (2006) found that computer use by 5 year old children was associated with the mother being older (40+), having tertiary education and studying. Rathbun, West & Hausken (2003) reported the existence of gaps -continuation of digital divide- across racial / ethnic groups and family income levels with respect to computer ownership and internet use among young children at home. For example, socio-economic status predicted access to computers at home.

THE STUDY

Objectives of the study

This study aimed to investigate:
a) ICT access and use by young children at home, and
b) the impact of gender, age and parents' educational background on children's use of ICT.

Procedure and sample

The collection of data took place between February and May 2009. A questionnaire

exploring children's home experiences of ICT was distributed -via the early childhood teachers- to families whose children were attending seven state run (not private) kindergartens in Athens. The questionnaire was followed by an informative consent letter, including the purpose of the research. 263 questionnaires were distributed, of which 147 were returned (the response rate was 56%). The sample of the study consisted of 147 families of children aged 4-6,5 years old, most of them being over 5 years old (this age group is predominant in state run kindegartens in Greece, due to compulsory attendance). Out of the 147 children, 77 were boys and 70 were girls. Table 1 shows the demographic characteristics of the children. It is noted that, due to the limited sample size, all percentages presented in this paper were rounded to integer values.

TABLE 1

Demographic characteristics of the children				
			age of child		total
			4-5 years old	over 5 years	
gender	boy	Count %	22 56%	55 51%	77 52%
	girl		17 44%	53 49%	70 48%
	total		39 100%	108 100%	108 100%

Regarding parents' educational background, there were missing values (20%). We investigated the relationship among missing responses and specific variables (which were found to be linked to parents' educational background, such as "use of educational software" and "watching DVDs"), and the investigation did not show statistically significant relationhips. From those families who responded, 41% of the children come from families with mean educational background from elementary school up to Lyceum (which we will refer to as 'low' educational background), while 59% of the children come from families with mean educational background from higher technological educational institutions (TEI) / universities (AEI) up to postgraduate degrees (which we will refer to as 'high' educational background). The majority of the families had as their mother language the Greek language, while only a few were of other origin (Albanian, Arabic, Polish and Georgian).

The questionnaire
Data were collected by the use of a questionnaire which was taken and slightly adapted

from McPake et al. (2005). It contained questions regarding demographic characteristics (e.g., children's age, gender and parents' educational background) and questions regarding childrens' home experiences of ICT. These questions were about the type of technologies (computer, game console, programmable toys etc.) used by children at home, the access and frequency of computer use (by the child) at home, the sorts of activities the children do on the computer (play games, watch DVDs, use drawing software etc) and whether the children use these technologies on their own or with other persons (sections of the questionnaire are shown in Appendix).

RESULTS

Access to and use of technology at home

Table 2 displays the percentages of children (n=147) and the use of different technology items: the technology items are displayed in descending order according to the column "alone" (the child usually uses the item alone). It seems that young children have access to and use a wide range of technology items (TV, robots, DVD, musical keyboard, console games, computers etc.) at home. However, the way (i.e. alone or with other people) they use these items varies. The majority of the children (over 53%) were reported to use "alone" the TV, the robots, the DVD and the musical keyboard, while 43% use "alone" the CD/ tape player and discs. Regarding computer

TABLE 2

Percentages (%) of children (n=147) and the use of different technology items: the technology items are displayed in descending order according to the column "alone" (the child usually uses the item alone)

	alone	needs help	with siblings	with adult	never	total
TV	66	13	3	15	3	100
Toys-robots	58	7	1	1	33	100
DVD	53	25	3	14	5	100
Mus. keyboard	53	8	3	2	34	100
CD/tape player and discs	44	18	3	16	19	100
Handheld electr. games	21	6	4	3	66	100
Game console	18	8	8	7	59	100
Educ. software	11	16	5	20	48	100
Digital camera	10	8	1	14	67	100
Ms Office	8	14	4	20	54	100
Computer	6	20	15	28	31	100
Printer	4	3	1	8	84	100
Video camera	1	4	1	7	87	100
Internet	1	3	3	14	79	100

Percentages (%) of children (n=125) and their computer activities at home: the activities are displayed in descending order according to the column "alone" (the child usually does this alone).

	alone	needs help	with siblings	with adult	never	total
Watches DVDs or videos	31	15	4	18	32	100
Uses drawing software	23	16	5	14	42	100
Plays computer games	16	13	15	17	39	100
Looks at digital photos	11	7	1	39	42	100
Uses writing software	10	12	2	14	62	100
Visits websites	2	2	0	10	86	100
Uses e-mail	1	0	0	1	98	100

use, a considerable percentage (28%) uses it with an adult or with siblings (15%), while only a few children (6%) use it on their own. For example, when using educational software, children usually need help, while half of the sample never uses this. Technology items or applications which are never being used by the majority of the childen are the video-camera (87%), the printer (84%) and the internet (79%). Similarly, high percentages of no-use by children were given to digital camera, handheld and console electronic games.

Access to computer at home and frequency of use
85% of the sample (125 out of 147 children) has a computer at home. Among these 125 children: 8% uses it every day, 32% several times a week, 30% about once a week, 13% about once a month and 17% less than once a month. Therefore, it appears that the majority of the children, who use the computer, do so about once or several times a week.

Types of children's computer activities at home
Table 3 displays the percentages of children (n=125) and their computer activities at home: the activities are displayed in descending order according to the column "alone" (the child usually does this alone). The activities children usually do on their own are: watching DVD or videos (31%) and using drawing software (23%). Looking at digital photos is an activity usually done with an adult in the family (38%), while visiting websites and using e-mail are never carried out by most of the children (86% and 98% respectively).

The impact of gender on children's use of ICT
Regarding the impact of gender on children's use of ICT, there were statistically

TABLE 4

Relationship between gender and the use of console games (n=147)

| | | | gender | | |
			boy	girl	total
console games	alone		21 27%	6 9%	27 18%
	needs help		7 9%	4 6%	11 8%
	with siblings	Count %	7 9%	5 7%	12 8%
	with adult		7 9%	3 4%	10 7%
	never		35 46%	52 74%	87 59%
total			77 100%	70 100%	147 100%

* $x^2(4)=14,1$ p=0.007

significant differences with regard to the use of console games and programmable toys-robots. Table 4 displays the relationship between gender and the use of console games. We found statistically significant difference between gender and the use of console games, whether the children use them on their own or with other people [$x^2(4)=14,1$ p=0.007]. Overall, 55% of the boys versus 26% of the girls use the console games

TABLE 5

*Relationship between gender and the use of programmable toys
(e.g. cars, dolls), robots (n=147)*

| | | | gender | | |
			boy	girl	total
Programmable toys-robots	alone		53 69%	32 46%	85 58%
	needs help		6 8%	5 7%	11 7%
	with siblings	Count %	0 0%	1 1%	1 1%
	with adult		1 1%	0 0%	1 1%
	never		17 22%	32 46%	49 33%
total			77 100%	70 100%	147 100%

* $x^2(4)=11,6$ p=0.021

either on their own or with others. The contribution to this significant difference derives mainly from the difference of the percentages in the column "alone". That is, 27% of the boys use the console games "alone" (on their own) compared to 9% of the girls. Table 5 displays the relationship between gender and the use of programmable toys (e.g. cars, dolls)-robots. We found statistically significant difference between gender and the use of programmable toys - robots, whether the children use them on their own or with other people [$x^2(4)=11,6$ p=0.021]. Overall, 78% of the boys versus 54,3% of the girls use the programmable toys-robots either on their own or with others. The contribution to this significant difference derives mainly from the difference of the percentages of the column "alone". That is, 69% of the boys use the programmable toys - robots "alone" (on their own) compared to 46% of the girls.

The variable gender was not significantly related either to the frequency of computer use or to the activities children do on the computer. Regarding the computer activity "(the child) uses drawing software", out of 125 children who use a computer, 61% of the girls versus 54% of the boys use a drawing software either on their own or with others, and this relationship is close to statistical significance. It is interesting to mention that although more girls than boys use this type of software, the percentage of boys who use it on their own is larger than that of the girls': 27% of the boys use it "alone", compared to 19% of the girls.

The impact of age on children's use of ICT

Regarding the impact of age on children's use of ICT, there were not statistically significant differences. The variable age was not related either to the technology items, or to the frequency of computer use or to the activities children usually do on the computer. However, we found a few differences close to statistical significance, between the two age groups of our sample: children aged 4-5 (younger) and aged over 5 years (older).

The relationship between age and the items "computer" and "handheld electronic games (e.g. GameBoy)" was close to being significant, and in both cases older preschool children were found to use it more than younger preschool children. In the age group of over 5 years, the computer is being used by 70% and the handheld electronic games by 37%, while in the age group of 4-5 year old the percentages are 64% and 24% respectively. Similarly, more elder children (86%) use the CD / tape player in comparison to the younger children (67%).

Regarding computer activities, out of 125 children who use a computer, more elder children use writing and drawing software compared to younger children, either on their own or with others and the relationship is close to statistical significance. For example, 59% of the children over 5 years old use drawing software compared to 53% of 4-5 year olds. However, as the children grow older (from the 4-5 to the over 5 age

group), there is an increase in the percentage of children who do this computer activity on their own.

The impact of parents' educational background on children's use of ICT
The cross tabulation showed no significant difference between parents' educational background and the technology items used by children at home. By investigating the relationship between educational background (low or high) and the technology items, with the help of a chi-square test, a significant relationship was shown between parents' educational background and the use of educational software by children. Out of the 147 children of the sample, 23% of the children who come from families of high educational background use it (usually alone but need help from time to time), in comparison to 2% of children who come from families of low educational background. The digital camera was also found to be used more by children whose parents have high educational background (overall, 39% from high versus 21% from low).

The parents' educational background was related to children's watching DVDs / videos on the computer. Out of 125 children who use the computer, 80% of children with parents of low educational background watch DVDs / videos versus 54% of children with parents of high educational background. Finally, the variable parents' educational background was not related to the frequency of computer use.

Discussion and Conclusions

Our findings indicate that young children aged 4-6,5 years old who attend these particular kindergartens in Athens have access to and use a range of technologies in the home, involving not only computers but also a wide range of domestic leisure technologies and electronic toys. The children usually tend to use on their own the TV, the programmable toys and robots, the DVD, the musical keyboard, as well as the CD / tape player. 85% of the children in the sample have and use a computer at home, most of them using it about once or several times a week. The above findings seem to be consistent with earlier research (McPake et al., 2005; Straker et al., 2006; Plowman, McPake & Stephen, 2010). For example, McPake et al. (2005) found that the most used items for 3-5 year old children were the TV and the computer. Straker et al. (2006) showed that 56% of 5 year old children used computers at some time during each week, while Marsh et al. (2005) found that 53% of children up to 6 years were using a computer at home. The technology items / applications which are rarely or never used by the children are the video-camera, the printer and the internet. We found that the children often use the computer with the help of another person in the family (adult or siblings), rather than on their own (e.g., as they mostly do with the TV). Computer activities children usually carry out on their own are watching DVD/ videos and using

drawing software (activities also very popular in Stephen's et al., 2008, study), while looking at digital photos or using educational software are activities usually done with the help of another person at home. This raises the issue of the role of adults (and more knowledgeable people, such as siblings, friends) at home, in supporting children to learn to use more complex equipment/ applications.

The variables gender, age and parents' educational background had an occassional isolated impact on children's use of ICT. The variable gender had an impact / influence only on the use of console games and programmable toys (e.g., cars, dolls)-robots: more boys than girls tend to use these items, either alone or with other people, and the difference derives mainly from that the boys use the above items on their own. In Marsh's et al. (2005) study console games were likely to be owned by boys. This issue could be linked to the toys' industry-market which designs more products closer to the interests of boys. We also found that although the girls tend to use more the drawing software, the boys do this activity usually on their own. The fact that the boys tend to use particular items / applications on their own, may be due to that their families encourage them to do so (further investigation into parents' views and practices could provide some information on this issue). Apart from the above isolated effects, the gender was not related to the use of technology items, frequency of computer use, or computer activities. This means that boys and girls seem to have comprable levels of technology access and use at home. The findings are in agreement with DeBell & Chapman's study (2006) who reported that overall computer use rates for young boys and girls are now about the same, and with other studies (Anand & Krosnick, 2005; McPake et al., 2005) which found only isolated links of children's gender and their use of ICT at home.

The variable age was not significantly related to children's use of ICT. However, some differences close to statistical significance were shown between the younger children (aged 4-5) and the older ones (aged over 5 years). Older preschool children were found to use the computer, the handheld electronic games and the CD / tape player more than younger preschool children. In addition, the use of writing and drawing software is a more frequent activity among older children, and as children grow up they tend to carry out such activities on their own (rather than with the help of another person). Such finding is an immediate result of children's development because older preschool children are likely to have an advantage (are more skilful in terms of fine motor skills) in commandeering a technology item to use.

Parents' high educational background was related to the use of educational software and the use of digital camera, by children. This fact combined with the result that using educational software or looking at digital photos are activities usually done with the help of another person at home, means that parents / families with high educational background support their children's use of such technology items /

applications. Educational software appears to be bought by families with high educational background and further research could reveal the particular software used by young children (as well as different ways of using it). On the other hand, children whose parents' educational background is low, tend to watch more DVDs / videos on the computer.

The results of this study cannot be generalised because the sample was not large and all children attended kindergartens in the city of Athens. ICT use for boys and girls was about the same. No group of children (based on gender, age, or parents' educational level) appears to be at a particular disadvantage with regards to technology / ICT access and use at home. From the above findings, we cannot discuss about 'digital divide' in the age group of 4-6,5 yeas old, but there are some consequenses for early childhood education teachers and for closer links between home and kindergarten.

Formal early childhood education settings do have a particularly important role to play so as to meet the diverse needs of all children. The Greek Cross-Thematic Curriculum Framework (DEPPS) for early childhood education (YPEPTH - PI, 2003) does not make reference to the broad range of technology / ICT items kindergarteners may encounter outside their school, nor to children's home experiences with ICT. Therefore, the role of early childhood teachers emerges as essential. Teachers need, for example, to be aware of young children's use of ICT at home (and consequent developing competencies), to find ways to integrate and further develop children's competences, and to consider how best to support children whose home experiences of ICT are limited. Teachers may also need more pedagogical support in order to ensure best value is obtained from technology. Early childhood teacher training, could draw their attention to the nature of children's home experiences with ICT and to the cultural and educational value of these experiences.

ICT use by young children at home is expected to increase, while children who have and use computers at home are more likely to have greater confidence and competence with basic computer skills. ICT resources at home together with ways of use and socio-cultural contexts, create learning contexts that influence outcomes for young children. However, there is little knowledge in early childhood settings about children's ICT experiences at home because parents are not usually asked for such an information (Siraj-Blatchford & Siraj-Blatchford, 2006). We recommend the establishment of closer links between home and kindergarten. For example, stronger and more collaborative relationships between parents and teachers, through sharing information about effective uses of technologies at home (and at school) to promote and enhance learning. It is important that teachers learn more about what children are able to do through ICT outside the classroom, and build on children's existing competences. In addition, they can discuss with parents the learning potential of ICT in the home as well as the potential dangers for the children (e.g., long term exposure to screen-based media,

violence or gender stereotypes in electronic games, inappropriate software). Parents may benefit from user-friendly advice on ways in which children and adults can make use of ICT in the home together. Regarding the issue of cooperation-communication between home and kindergarten, it is also very useful for the parents to know what their children do with technology at kindergarten. Parents could, for example, observe young children while working with ICT in the class, or participate in workshops where they can talk about their children's work with technology.

Our future plans include the investigation of parents' / families' views-expectations of their young children's use of ICT and the comparison of technology use among children who attend different type of kindergarten (e.g., urban, rural). Young children who have varied and extensive use of ICT at home may be in a better position to take advantage of the opportunities to learn about and with ICT in formal educational settings. ICT is not just about computer use or just about achieving skills. It includes children's growing technological awareness, their understanding that there are ICT tools they can experiment with and they can begin to control-use for their own purposes. In the longer term, children's earlier technological experiences at home may / will influence their interaction with ICT at school, in ways which are difficult to identify right now.

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APPENDIX

Sections of the questionnaire – Children's home experiences of ICT

3) Which of these types of technology does your child use at home? Who does your child usually use them with? (Please tick one box only for each row)

	The child…				
	…usually uses it alone	…usually uses it alone, but needs help from time to time	…usually uses it with sister(s)/ brother(s)/ friend(s)	…usually uses it with an adult	…never uses it
Computer (including laptops)					
Printer					
Digital camera					
Internet					
Educational software (e.g. CD-ROM programs such as "exploring the body")					
Microsoft Office programs (e.g. Paint, Word)					

Game console (e.g. Playstation, Nintendo, Xbox)					
Handheld electronic games (e.g. Game Boy)					
DVD player and discs					
TV					
CD/tape player and discs					
Video camera					
Programmable toys (e.g. cars, dolls) - robots					
Musical keyboard					

4) Do you have a computer at home?   Yes   Please answer the questions below

No   Please go to question 7.

5) How often does your child use the computer at home?

Every day   Several times a week   About once a week

About once a month   Less than once a month

6) What sorts of activities does your child do on the computer? Who does the child do them with? (Please tick one box only for each activity)

	The child…				
	…usually does it alone	…usually does it alone, but needs help from time to time	…usually does this with sister(s)/ brother(s)/ friend(s)	…usually does this with an adult	…never does this
Plays computer games (e.g. the Sims, Barbie)					
Watches DVDs or videos					
Uses drawing software					

Uses writing software					
Visits websites					
Looks at digital photos					
Sends and receives e-mail messages					
Other. Please say what: 1…………..					
2……………					