Chapter 4
Investigating Young Children's Engagement with Computer Use as a School Activity: A Pilot Study

Kleopatra Nikolopoulou and Vasilis Gialamas

Introduction

Researchers (e.g., Clements and Sarama 2003; Siraj-Blatchford and Siraj-Blatchford 2006; McCarrick and Li 2007; McKenney and Voogt 2012; Howard et al. 2012) agree that the computer can be used as a tool to support learning and assist communication, collaboration, creativity, and language development in young children. The active, appropriate use of technology/ICT can support and extend traditional materials in valuable ways. The teaching and learning research program (Plowman and Stephen 2006) reported that encounters with ICT can enhance key areas of young children's learning, such as dispositions to learn (e.g., by increasing confidence, by supporting independence, and persistence in the face of initial difficulties), knowledge of the world (e.g., learning about mathematics, language), and operational skills (e.g., using a mouse, physical dexterity, or developing hand–eye coordination). Research studies point to the positive effects of technology in children's learning and development, both cognitive (e.g., Kalogiannakis and Zaranis 2012; Binder and Kotsopoulos 2011) and social (e.g., Kumtepe 2006). Regarding the socioemotional domain, children have shown interest in using the computer and improvement in their self-esteem (Hatzigianni and Margetts 2012), while regarding the development of children's fine motor skills research refers to mouse control and

K. Nikolopoulou (✉)
Department of Early Childhood Education, Secondary Education and University of Athens, 10680 Athens, Greece
e-mail: klnikolopoulou@ath.forthnet.gr

V. Gialamas
Department of Early Childhood Education, University of Athens, 10680 Athens, Greece
e-mail: gialamasbasilis@yahoo.gr

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hand–eye coordination (Parette and Blum 2013; Saçkes et al. 2011). Brooker and Siraj-Blatchford (2002) reported that computer use in kindergarten classroom increased young children's confidence and self-efficacy, and it was also an enjoyment.

In parallel, the role of kindergarten teachers is essential in supporting and improving young children's computer/ICT experiences in kindergarten class (Stephen and Plowman 2008). Maximizing the learning benefits of ICT requires a pedagogy which values pleasure and engagement as well as operational skills. Play and ICT use in kindergarten are often linked, and kindergarten teachers often believe that playing with ICT is an effective mode of learning and developing children's technological competence (Nikolopoulou and Gialamas 2015). Using the computer is now a reality for several kindergartens in Greece (see Chronaki and Stergiou 2005; Fesakis and Kafousi 2008; Nikolopoulou 2014), while the National Curriculum for ICT in preschool and primary education states: "(children) use software and internet services… integrating ICT in kindergarten's daily activities as teaching aids, as investigative and problem-solving tools, as well as for digital literacy, expression, creation, communication, and collaboration" (YPEPTH-PI 2012). Indicatively, the section "I familiarize myself with ICT and I create" refers to the acquaintance, familiarity, understanding of the basic functions, and the progressive autonomy in the use of the computer system, the section "I explore, I experiment, and I discover with ICT" refers to the use of educational software (open ended problem-solving activities software as well as closed problem-solving software), while the section "ICT in society and culture" refers to the development of attitudes and social skills. The USA National Association for the Education of Young Children and the Fred Rogers Center reported that technology/ICT are tools that can promote effective learning and development when they are used intentionally by early childhood educators, within the framework of developmentally appropriate practice (to support learning goals) and they also reported principles to guide technology use in early childhood programs (NAEYC and FRC 2012). They stated that when technology is used appropriately, it can enhance children's cognitive and social abilities. Due to the above, both the empirical evidence and the curricula requirements associate computer use in kindergarten with different domains such as cognitive, socioemotional, and fine motor skills domain.

In Greece, although there some research studies regarding computer use/integration in kindergarten classes, this use has hardly been assessed in relation to different domains. Children's assessment by their teachers may assist, among others, in providing feedback and in improving the learning process. This paper is a pilot study aiming to investigate children's engagement in computer use as a school activity. In particular, it aims to investigate their engagement in different domains identified in the literature such as knowledge, skills, and socioemotional. For the purpose of this paper, specific terms used are briefly explained. Initially, the term *computers* is used as synonymous and as more preferable to the terms *ICT* (Information and Communication Technology) and *technology*. Apart from computer software, a number of products that incorporate some aspects of ICT are available to young children such as electronic-musical keyboards, programmable interactive toys,

and digital cameras. However, practitioners define ICT more narrowly as computers and printers and this view is very influential (Stephen and Plowman 2008) till now. The term *kindergarten* is used as synonymous to the terms *early childhood setting* and *preschool*. This term refers to kindergarten classrooms (formal educational settings) that attend children above 3 years old. The aim of this study was to investigate young children's engagement in computer use in kindergarten (knowledge, skills, dispositions, and feelings displayed around the classroom computer).

Methodology

Research Objectives

The objectives of the pilot study were the following:

- To investigate the degree of children's engagement with the computer in kindergarten class.
- To determine the relationship between children's engagement with the computer and specific characteristics (gender, age, access to computer at home, frequency of computer use in class).

Furthermore, a specific objective was to determine the limitations of the pilot study in order to design better the main study. The investigation of other factors, such as the effect of the type of software and class organization, was beyond the scope of this study.

Sample

Twenty-nine children from twelve different state kindergartens in Athens, Greece, participated in this study. Ten kindergartens had only one computer, and the rest (two kindergartens) had two computers. The age range of children in Greek kindergartens is between 4 and 6, 5 years old. Table 1 shows the distribution of children by age group and gender. The majority of children were 5–5.5 years old, as the attendance is obligatory for this age group. The degree of each child's engagement/involvement in computer use was recorded by his/her teacher (the data collection instrument is described below). The teachers were all women, they were

Table 1 Number of children by gender and age group

		Girl count	Boy count
Age group	4–4.5	2	1
	5–5.5	8	16
	6–6.5	1	1
	Total	11	18

working in different kindergartens, and during autumn 2013, they were doing their practice—as part of B-level teacher training in ICT (YPEPTH 2014). Their participation in the pilot study was voluntary. The teachers were asked to select children who would have their first contact with the computer in kindergarten (preferably not to have a computer at home). Regarding ethical research practice, permission was gained from the gatekeepers–teachers.

Research Instrument and Procedure

A questionnaire was used for children's assessment, which was taken from the relevant literature (Brooker and Siraj-Blatchford 2002). According to these researchers, all statements of the questionnaire (a) were based on evidence from classroom observations in preschools and (b) they were in line with Katz's (1995) suggestion that all of early childhood education should be assessed in terms of knowledge, skills, dispositions, and feelings. The questionnaire was selected because it explores children's engagement with the school computer, holistically, i.e., apart from knowledge and skills, it investigates children's feelings, dispositions, and social behavior displayed around the classroom computer. The questionnaire included 10 statements/items (S1–S10) corresponding to five categories: The items S1 and S2 correspond to the category "knowledge (hardware and software)," the statements S3 and S4 to the category "skills (mouse control, coordination)," the statements S5 and S6 to the category "dispositions (exploration, resilience)," the statements S7 and S8 to the category "feelings (enthusiasm, enjoyment)," and the items S9 and S10 to the category "social behavior." For example, the item S3 regards the child's skill to control the mouse ("Handles mouse appropriately and can use it to point and click"), the item S7 regards the feeling of "enthusiasm" ("Enthusiastic and eager to work at computer"), while the item S9 regards an aspect of social behavior ("Enjoys sharing computer experience with peers, in operating or supporting role"). For each of the 10 items of the questionnaire, the answer had to be given in a scale of 1–5: number 5 (strong statement) expresses the highest degree of conquering the content of the item, while number 1 (weak statement) expresses its complete absence. The items of the questionnaire were in line with the axes of the Greek ICT curriculum for kindergarten. As the second part of the questionnaire, we added some questions regarding specific characteristics of the children (age, gender, access to computer at home) and the kindergartens (number of computers, ways of computer use from September to November 2013, type of software, frequency of computer use in class).

The questionnaires were distributed to the twelve kindergarten teachers mid-September 2013, and they were returned back in November 2013. They were anonymous, and each questionnaire was completed by the class teacher for each child separately. Each kindergarten teacher returned one to four questionnaires, i.e., she assessed one to four children in her class. The selection of children was made by the teachers. The condition set by the researchers was, for the participant

children, to use the computer for first time within the class environment (and preferably not to have a computer at home). For this reason, the study was conducted at the beginning of the academic year (early autumn), when children begin to use the computer in kindergarten class as a school activity.

Results and Discussion

Degree of Children's Engagement in Computer Use in Kindergarten class

Table 2 shows the frequency responses (n = 29 children) by scale (1–5) on the 10 statements of the questionnaire. Regarding the category "knowledge," most children were assessed within the scale numbers 1 and 2 (minimum conquest of statement content). Out of 29 children, 22 and 23 children had minimal prior knowledge for items S1 and S2, respectively; they had little initial knowledge in tracking programs/applications and in navigating around programs. This means that

Table 2 Frequency responses (n = 29 children) by scale (1–5) on the 10 statements of the questionnaire

10 (strong) statements (and their correspondence to the categories: knowledge, skills, dispositions, feelings, social behavior)	1*	2	3	4	5*
S1 (knowledge 1: hardware). Knows how to set up the computer and locate programs	11	11	4	3	0
S2 (knowledge 2: software). Knows how to navigate routes through one or more programs	16	7	3	3	0
S3 (skills 1: mouse control). Handles mouse appropriately and can use it to point and click	0	11	10	6	2
S4 (skills 2: coordination). Handles mouse successfully and can use it to drag and drop objects on screen	4	9	7	7	2
S5 (dispositions 1: exploration). Keen to experiment with computer and with unfamiliar software and techniques	4	2	11	9	3
S6 (dispositions 2: resilience). When experiencing difficulty, error or failure, is spurred to keep trying or make more effort	3	4	15	5	2
S7 (feelings 1: enthusiasm). Enthusiastic and eager to work at computer	1	2	10	12	4
S8 (feelings 2: enjoyment). Appears relaxed and happy while working at the computer	1	2	13	8	5
S9 (social behavior 1). Enjoys sharing computer experience with peers, in operating or supporting role	2	3	4	14	6
S10 (social behavior 2). Takes turns without difficulty and surrenders to another child cheerfully	2	9	3	11	4

*Number 5 in the scale expresses the highest grade of conquering the content of the item (strong statement), in contrast to number 1 which expresses its complete absence (weak statement)

children did not have the specific knowledge before using the computer in class, an issue which highlights the essential role of the school in the whole process of learning with/about ICT. The assessment of children appeared higher in the category "skills," where the majority of the children (27 and 23 children for statements S3 and S4, respectively) were assessed within the scale numbers 2 (a little), 3 (moderate), and 4 (good). Interestingly, the highest assessment results appeared for the categories "dispositions" and "feelings." Most of the children (22 or more, out of 29 children) were assessed within the scale numbers 3 (moderate), 4 (good), and 5 (very good), and in particular within the middle scale (3 and 4). This means that although the children lacked knowledge of how to navigate around a program or their mouse skills were still low, they did show interest in experimenting with the computer and they were happy when they were working at the computer corner. This finding is in agreement with earlier research which revealed young children's interest in technology (Parette and Blum 2013). Additionally, there is an agreement in that computer use in kindergarten facilitates the socioemotional development of children (see Howard et al. 2012; Hatzigianni and Margetts 2012); for example, it improves children's self-esteem, cooperation, and communication skills.

With regard to the categories "dispositions" and "feelings," some excerpts from teachers are presented here: "Computer use helps him in strengthening his self-esteem—he feels he has grown up and in this school he deals with something important… he becomes increasingly better" (child 1); "He had no contact with the computer at home, only with the play-station. He is willing to use the computer but he will not choose it by himself—unless his friend selects it or I ask him" (child 6); "Acceptance of the computer with enthusiasm but with little uncertainty as to its operation" (child 15); "While initially he had no contact with the computer, later, he changed his attitude and he was looking for it more often during the free activities" (child 23).

Provided that the frequency of computer use per child was once a week and that the questionnaires were completed within the first months of the academic year, the children had used the computer in class for a few times (5–7 times). Regarding the way of computer use in kindergarten class, the teachers reported that it was mainly used during the hour of free activities, at the computer corner. This confirms an earlier study (Nikolopoulou 2014) carried out in 17 state kindergartens in Athens, which revealed the computer to be predominantly used during the hour of free activities. In this study, the teachers stated that the computer was used as an empowerment tool in their daily teaching practice, as an entertainment tool and for searching information in the web. For example, it was reported that it was used for acquaintance with the parts of the computer, for familiarization with the use of the mouse, for exercising the drag-and-drop technique, and for saving and printing files. All the ways mentioned by the teachers are in accordance with those suggested by the Greek kindergarten curriculum. The software programs used were mostly, those proposed/exercised in B-level teacher training in ICT course (such as Tuxpaint, Revelation Natural Art, Kidspiration, and Puzzle programs).

The questionnaire is useful because it contains statements related to different domains: cognitive, socioemotional, and fine motor skills domain. However, it is

more useful to be combined with qualitative data such as classroom observations and interviews with kindergarten teachers. The lack of qualitative data was a limitation of the pilot study, and it is discussed in the last section. The questionnaire was completed at the beginning of the academic year, when children begin to use the computer at school. The interdisciplinary curriculum framework (D.E.P.P.S) for kindergarten (YPEPTH-PI 2003) reports that children's assessment—as a pedagogical act—is a continuous process, is being spread during the daily teaching practice, and is formative as to the ways and techniques. This questionnaire is proposed to be used throughout the academic year, in order to become a part of the individual child's portfolio, associated with the section "familiarization and use of a computer."

Relationship Between Children's Engagement in Computer Use and Specific Characteristics

It was found that none of the five categories (knowledge, skills, dispositions, feelings, and social behavior) was statistically significant associated with the individual characteristics "age," "gender," and "computer use in kindergarten." The frequency of computer use was mainly once a week or several times a week. The absence of significant correlation with the frequency of computer use (by the child) may be due to the homogeneity of the frequency of use, among different children. The only significant correlation was between each of the categories "knowledge," "skills," and "social behavior" with the characteristic "access to a computer at home." Sixteen out of 29 children had a computer at home. Table 3 and Fig. 1 show the relationship with this characteristic. Those children who had a computer at

Table 3 Mean values on categories for the characteristic "access to a computer at home"

5 categories	Children's access to a computer at home			
	Yes (n = 16)		No (n = 13)	
	Mean value	Standard deviation	Mean value	Standard deviation
Knowledge (hardware and software)	2.31_a	1.05	1.31_b	0.43
Skills (mouse control, coordination)	3.25_a	1.08	2.42_b	0.73
Dispositions (exploration, resilience)	3.06_a	1.08	3.08_a	0.93
Feelings (enthusiasm, enjoyment)	3.66_a	0.77	3.35_a	0.97
Social behavior	3.84_a	0.87	2.92_b	1.10

Note Mean values of the same row with different indices differ significantly ($p < 0.05$) in the 2-sided test

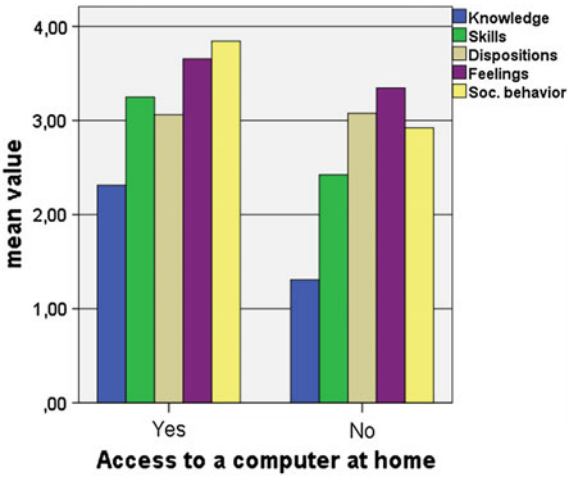

Fig. 1 Mean values on categories and children's access to a computer at home

home had higher mean values for the categories "knowledge" (2.31 vs. 1.31 for those not having a computer), "skills" (3.25 vs. 2.42), and "social behavior" (3.84 vs. 2.92). This finding is consistent with earlier research which showed that access to and use of a computer at home affected children's performance in class (Espinosa et al. 2006). According to Saçkes et al. (2011), availability of a computer at home was a statistically significant predictor of children's baseline computer skills in kindergarten. Of course, access by itself is not enough to favor young children; thus, more qualitative data is needed.

Conclusions

This paper regarded a pilot study. Although the findings cannot be generalized, they contribute to the ongoing debate regarding computer/ICT use in kindergarten class. The questionnaire used investigates young children's engagement in computer use holistically: Besides knowledge and skills, it investigates children's feelings, dispositions, and social behavior. This study adds to the body of evidence regarding children's overall development when using a computer in the classroom. Taken into account that computer is typically used during the free play activities of kindergarten classroom (Ljung-Djärf 2008), it is also important to know children's feelings and dispositions around the computer corner. The questionnaire is proposed to be completed by the teachers at the end of the different academic semesters, so as to become part of each child's portfolio (e.g., in relation to the child's familiarization and use of a computer). Each child's assessment could be continued by recording his/her participation and behavior at the computer corner. Regarding the questionnaire, it could be enhanced, maintaining the same five categories, by adding statements associated with (i) other aspects (sections) of different countries'

curricula for ICT in kindergarten and (ii) the educational material for B-level kindergarten teacher training in ICT (Komis 2010). For these to happen, the role of early childhood educators is very important.

To make informed decisions regarding the use of ICT in ways that support children's learning and development, early childhood educators need information and resources on the nature of these tools and the implications of their use with young children (NAEYC and FRC 2012). For example, early childhood teachers need guidance to make decisions about how to support learning through ICT, when and how to integrate appropriate digital technology in kindergarten classroom. This has implications for early childhood teacher training and their professional development. Quality professional development provides, for example, opportunities for hands-on technology training, a balance of appropriate activities, and ongoing support. Also, effective early childhood teachers recognize their roles in strengthening desirable dispositions in children. According to Bertram and Pascal (2002), dispositions (such as resilience, social competence, and self-concept) are linked to effective learning.

The pilot study revealed some limitations which must be considered in further research. The limitations include the small sample of children, the use of only a quantitative instrument, and the lack of data on how children use the computer in the home. The completion of this questionnaire should be combined with classroom observations and interviews with the teachers, because the combination of qualitative and quantitative data leads to a more complete investigation and interpretation of a situation. For example, the effect of the type of software and the organization of activities could be revealed via the use of qualitative data/techniques. It would also be useful to collect data regarding children's computer use at home, as this characteristic seems to affect specific knowledge (for hardware and software), skills (mouse control, coordination), and social behavior, during the process of computer use in class. This finding warrants further consideration as researchers showed that those children who have access to ICT outside the school have already acquired some technological/digital experiences before they attend kindergarten (Zevenbergen and Logan 2008). Future research is suggested to take into account previous ICT experiences of children, experiences mainly acquired at home. This process could, in combination with other activities, strengthen the link between kindergarten and home. This questionnaire is proposed to be used with other preschool populations, as well as in other countries in order to identify possible similarities and differences.

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