This study examined the level of knowledge that Greek preschool children had about computers. How Vygotsky’s theory about socio-cultural learning, as a teaching process, could be effectively applied when new knowledge was presented to a classroom environment was investigated. Participants were Greek preschool children and teachers. Data collection included classroom observations, informal interviews, questionnaire administration, and field notes. Results revealed that following this approach, that teachers used to initiate children with computer technology was a thriving and effective one. The particular study gave the authors the opportunity to more closely search the ways in which children view new technologies, and the ways that teachers used it to develop their approach in introducing such new concepts.

Computers are playing an increasing role in all levels of education. They form an integral part of children’s education and play experiences (Simon, 1985; Pardeck & Murphy 1989, Lodge, 1991). Recent studies show the potential that computers have to support children in every stage of their cognitive development (Clements, Nastasi, & Swaminathan, 1993, Shade & Watson, 1990). According to Storey (1992), and Pange (1997), the knowledge of using computers makes children feel self-confident while other
studies reveal that computers are not effective in the classroom when they are misused (Turroff, 1999).

To develop children’s learning through the use of computers or technology in general, it is of utmost importance to understand their knowledge and their insights about computers. Many studies have shown the potential of using cooperative learning environments in teaching curriculum subjects. Research has also been conducted in the field of computer assisted learning and collaborative learning (Eraut & Hoyles, 1989; Light 1993; Messer & Light, 1994; Pozzi, Hoyles, & Healy, 1992). According to these studies collaborative learning offers quite a lot in mastering new concepts and knowledge when children are working with this kind of teaching instruction (Kontozisis, 2000).

The purpose of this study was to describe a project concerning the introduction of computers to preschool children, as well as to view the insights and the beliefs that preschool teachers had about new technologies. The main hypothesis was “how familiar are Greek preschool children with computers? What do they know about them? In what way do they view them?”

Towards an Understanding of the Vygotsky Theory about Socio-Cultural Learning

According to Vygotsky’s theory (1978, 1981) both teachers and older children play very important roles in learning. Parents and teachers are responsible for conducting their culture, and using language. These tools are social objects with certain modes of operation developed socially in the course of the labour. Tools can be either external (physical, technical) like instruments and machines or internal such as laws, signs, procedures, methods and language. Vygotsky’s constructivist theory emphasises the role of the active involvement of a teacher. For Vygotsky, children’s minds are constructed through interactions with the world and through the relationship between subject and object. Vygotsky also emphasized the critical importance of culture and the importance of the social context for cognitive development. The latter brings to mind the concept of “situated learning” (Lave, 1991, 1988). According to this approach, based on Vygotsky’s theories, the acquisition of new understandings cannot be separated from the context in which it occurs. So, in this study, to test the hypothesis the authors concentrated on the following four conceptual axes:
1. The well-known Zone of Proximal Development (ZPD) can be used as a great and useful tool for planning classroom activities. Vygotsky’s zone of proximal development probably is his best-known concept. It argues that students can, with help from adults or children who are more experienced, can master concepts and ideas that they cannot understand on their own. According to Vygotsky (1978):

The zone of proximal development is defined as the distance between the actual developmental level as determined through independent problem solving and the level of potential development as determined through problem solving under adult guidance or collaboration with more capable peers. (p.86)

2. Learning and development is a social, collaborative activity. According to Crook (1994, p.79) collaboration is central to the cultural approach in the same way that computation is central to the cognitive tradition and construction to the constructivist tradition. Collaboration for cultural theorists generally appears to mean that the teacher provides a structure of support for learners (children) who are aiming at achieving a goal (knowledge).

Crook (1994) analyses the variety of different ways in which computers can be part of the collaborative experience to learning. He distinguishes five different categories. These are:

(a) Collaboration with computers, sometimes is an idea that brings to mind a solitary, individual sitting at a keyboard working on a computer program. But, collaboration with computers is the goal of making such programs in order to “reproduce the social character of a face to face tutorial dialogue.” (Crook, 1994, p.119)

(b) Collaboration in relation to computers means that teacher-children interaction does not involve working at the computer, but means a kind of support. Discussing issues about computers in the classroom (or in a place where someone could find a computer) might be a good example.

(c) Collaboration at computers refers to times when small groups of learners work on the same computer activity at the same time. Two students working on the same task, such as drawing a picture using a Paint program.

(d) Collaboration around computers refers to learners working together more informally than when a small group is working at a computer on a common task. Crook says that material environments will constrain and facilitate a whole range of social interactions that can occur within them.
Finally, collaboration through computers means collaborating through networks, including the Internet. This last category was not compatible with our project because it was difficult to find computers with Internet access in the Greek kindergartens.

Two more conceptual axes of Vygotsky’s have to be discussed.

3. Learning should happen in a meaningful context and not be separated from learning and knowledge that children develop in the “real world.” For that reason, we tried not to separate the material taught during the project from the “real world.” Also, for that reason visits were arranged where children had the opportunity to see, experiment, and play with them. The latter is closely related with the idea mentioned later.

4. Out-of-school experiences should be closely related to the experience gained at school.

It is also important to mention here that in our study computers were considered as tools that increased children’s self esteem and attitudes and made children feel happy during teaching about New Technologies and computers.

**METHOD**

The whole project was based on the four basic principles of Vygotsky’s theory that are often met in many constructivist classrooms and which were explained briefly earlier in this article.

Children had the chance to actively participate in the learning process as in this project a Vygotskian approach to learning was followed. Visits to places where computers were, discussions between children about what they had seen, as well as actively participating (playing and drawing) with computer programs showed the effectiveness of the method used. From a constructivist point of view, a context for learning was created in which students participated in interesting activities that encouraged and facilitated learning. Their teachers did not simply stand by, but they helped children in exploring the new material, experimenting, and playing with it. During the whole project instructions were given to children as they were introduced into a new environment. They were encouraged to work in groups, as this kind of instruction offered them the opportunity to think about and discuss issues and questions collaboratively. Teachers, by using a collaborative
working scheme, supported them with encouragement and advice as they tackled problems. Having the computer as a focus, teachers and children discussed ideas about the computer’s use and its applications, listened to what one another said and built on one another’s experience and knowledge (Kontozisis, 2000). The project was set up as a pilot to investigate the knowledge that kindergarten children had about computers, as well as to formulate effective instruction to make children familiar with new technologies.

**Subjects and project description.** A self-selected group of 100 kindergarten teachers from many different regions of Greece took part in this project. They all attended a whole year course about the Information and Communication Technologies (ICT) in education. The course was part of a Program of Teachers Continuing Education. The content of the course focused on:

1. the use of the computer and its applications,
2. using multimedia in everyday classroom activities, and
3. planning effective ways of presenting (introducing) the computer and its applications to kindergarten children.

The use of new technology by the teachers was recognized as limited. At the end of the project preschool teachers gave a questionnaire to children. As children at this age have not developed their reading and writing skills, teachers were supposed to ask children the questions and write down their answers. Approximately 1,500 questionnaires were administered. Almost all children answered the questionnaire. Children who were absent the day the questionnaire was given did not answer the questions. The questions covered children’s age, sex, and the socio-economic status of their family. Also, some general questions about the knowledge, ability, and experiences they had with computers were asked. The interview sessions were videotaped. A University of Ioannina tutor, who specialized in the field of Educational Technology, coordinated the project. The researchers observed the children working on several occasions in different phases of the project. The role of the observations was to see how children interacted with the technology and discover their insights and attitudes towards the new tool. Thus, their answers were used to construct and implement an effective instructional approach to enhance children’s knowledge about new technologies.

A variety of classroom activities such as constructing a computer and its devices with paper-boxes and wood were used. Discussions between the teacher and the children about the use of computers and technology in everyday life were also initiated. The children and their teachers were interviewed after the project and asked to talk about their new experiences.
Results

According to the data, 48% were boys and 52% were girls. No gender differences were found in the way that boys and girls worked within the project and with each other.

Children’s age varied from 5-6 years old. The distribution of the children’s age is as follows (Table 1):

<table>
<thead>
<tr>
<th>Children’s age</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>5 years old</td>
<td>42.3%</td>
</tr>
<tr>
<td>6 years old</td>
<td>57.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Children belong to:

1. lower class 54.6%,
2. middle class 39.2%, and
3. upper class 6.2%.

Most of the children lived in villages (60%) and the rest (40%) lived in towns. At the end of the course, each teacher used a questionnaire to collect information about the knowledge that children had about computers. Having done so, each teacher prepared a project to introduce computers to children. The approach that each teacher used varied from one to another on simple matters such as, presenting computer images to children or illustrating computers and their devices, or presenting a real computer and playing with it. It is important to notice the fact that most children viewed the computer as a game.

From the first part of the project (information gathering) the results were amazing. From children’s answers to the question whether they have a computer available whenever they wanted to, we found out that only 21% of the children had a computer available at their home or at their parents’ office. Twenty-six percent of the children who are living in towns have a computer available whenever they want, and only 18% of the children who were living in villages or counties have the same. In this study the authors did not examine the percentage of computers available at children’s homes.
Introducing Computers to Kindergarten Children

in correlation to their socio-economical status as data for the upper social class considered being not indicative.

When children were asked, “What do you think that a computer does?” a great percentage replied that “You can draw” or “You can play games,” like “Free cells,” “Super Mario,” and “Minesweeper”. Comparing the social class that children belonged to, no significant difference was noticed ($x^2=2.4, df=2, p=3$).

We were amazed to find out that 28% of the children were aware of what a computer is and most of them said that they are always observing whether a computer exists in a place they visit. Although 15% of the children neither played with nor had a computer at home, they were aware of what a computer was. When these children were asked whether they know what the applications of the computer might be, they replied that the computer is used to write some text and to play some games designed exclusively for computers. The latter is indicative of the knowledge that children have about some of its applications.

Another remarkable result is that 44% did not know what a computer was and they had never seen one. The older the children were, the more they knew about computers. Thus, 55% were children at the age of six and 41% were five years old.

Finally, as mentioned before, when the researchers gathered these data and analyzed them, working together with the kindergarten teachers, a framework for instruction was planned regarding the way that computers should be introduced to children. Based on Vygotsky’s theory about teaching and learning it was decided the best way to do this was, (a) to discuss computers and other related issues; discussions were based on printed material illustrating computers at several places, printers, and other devices, (b) to make some visits to places were computers existed (outdoor visits), and (c) to bring a real computer in the classroom where children could experiment and practice with the new tool. Not all preschool teachers managed to have a computer in their classroom. For that reason they arranged some visits to The Department’s Computer Lab where they had the opportunity to experiment with various software packages such as drawing packages ($\text{Paint}$ and $\text{Dazzle}$), Word processing packages and other multimedia software. Collaborative patterns were noticed when children interacted with the computer. In terms of the categories that Crook refers to, we noticed that only four out of the five categories applied to this project.
Discussion

The results of this project included several important findings. The first finding supported the hypothesis that children do really know more things about computers than we expected them to. The results also indicated that although most children were familiar with computers, the use of different methods (visits to computers, discussion of printed material, active involvement with simple computer programs, etc.) enabled children to have control of their actions. From the drawings, (Figure 1) it was clear that children obtained knowledge about the parts of a computer. A more detailed analysis about the variety and the content of the images that children created will be discussed in a more detailed way in another forthcoming paper. According to the findings of this project, we can claim that the approach that teachers used to introduce computers to children was very promising and can easily be repeated in the future.

Also, it is clear from the project, that, apart from the children, teachers gained a lot of experience in teaching this subject and they felt more confident in using a computer and its applications in the classroom.

![Figure 1. Children's drawings](image)

Although kindergarten teachers were very willing to experiment and use new technologies, further support, instruction, and training were needed. Teachers were very anxious about the way or the capabilities required to use a software package successfully.

The other important outcome of this project was related to the collaborative patterns that children developed while working with the computer. Children who had more experience working with computers, helped all the other children who had no previous experience a lot. The children felt confident in asking questions and they were not afraid of doing so.
A major obstacle of this project was the lack of resources (infrastructure) in each school to allow both teachers and children to experiment and practice with them. It was obvious from this study that, depending on children’s personal characteristics and their ability to use a computer, they developed different ways of collaboration. At the beginning of the project children worked in groups, as the project went on and they felt more confident and competent, they appeared to have obtained a certain amount of autonomy.

**SUMMARY**

This study was specifically designed to examine the kind of knowledge that children have about computers and how a particular teaching approach helped to develop that knowledge. The methods and the conceptual framework of the study have proven to be effective in a way that enabled us to expand our understanding of the nature of children’s interactivity at the computer.

The approach used was considered to be of value to others in discovering more about the teaching instruction that preschool teachers have to follow to achieve their teaching goals. There are perhaps a number of questions or issues that might remain or be of concern, in that they are ambiguous or have not been discussed in terms of their implications. What the drawings of the children revealed? These probably will be addressed in another article.

**References**


