Research Article

# "I can imagine myself being inside PC and driving": Greek pre-schoolers drawing meaning of computers for them

Sofia Theodosiadou [1]* , Argyris Kyridis [1]

[1] Faculty of Education, School of Early Childhood Education, Aristotle University, Thessaloniki, GREECE

*Corresponding Author: sotheo@nured.auth.gr

| ARTICLE INFO | ABSTRACT |
|---|---|
| | As technology quickly and recklessly alters the way children interact, it also changes the way children learn and come to terms with this world. The present research considers the leading role of the computer in the lives of children and asks preschool children to draw their own concepts of the computer to shed light on what computers mean for them. Building upon Kress and van Leeuwen's theoretical framework of visual grammar, 70 drawings by children from kindergartens in Thessaloniki were analyzed both qualitatively and quantitatively. Children's pictorial depictions of their understanding of computers suggested they ascribe to them a powerful and multidimensional face, since, while they admire what a PC can do, at the same time they feel quite distant from their superpower.<br><br>**Keywords:** conceptualizing computers, children's drawings, semiotic analysis, media and children |

## INTRODUCTION

Computers have become central to children's lives in the 21st century as they play a crucial role in experiential learning, helping children achieve academic goals, become more creative both in problem solving and in self-guided instruction (Dong, 2018; Gardasevic et al., 2015; Heather et al., 2018; Prensky, 2004; Rücker & Pinkwart, 2016; Tomé et al., 2019). As a consequence of all the above, they have become "digitally wise" by making smarter decisions (Prensky, 2009). Previous research found (Vasiljevic et al., 2015) that a computer with an internet connection seems to be the number one medium that children and teenagers would take with them to a deserted island. Furthermore, children who used the Internet more had higher scores on standardized tests of reading achievement and higher-grade points than children who used it less. The appropriate use of computers at an early age makes the educational process more interesting and creative and contributes to higher quality integration of diverse contents (Vasiljevic et al., 2015).

Although research on children and computers has been extensive for many decades (Zawacki-Richter & Latchem, 2018) and from a great variety of perspectives–the teachers' perspective (Dong, 2018; Dong & Newman, 2016; Dore & Dynia, 2020; Marklund, 2020; Otterborn at al., 2019; Theodosiadou & Markos, 2013); the parents' perspective (Hadad et al., 2020); children's point of view (Cetintas & Turan, 2018)–there is still skepticism towards the core

question of whether the use of computers has positive effects on children. Gardasevic et al. (2015) argue that the computer counterpoise both positive and negative effects on childhood depending on the guidance that parents and teachers give to them (e.g., educational programs and well-designed games enable children to improve their knowledge and skills) (Gardasevic et al., 2015) but also depend on the skills that are being cultivated (e.g., quantitative skills might be positively affected by computer use) (Heather et al., 2018). According to Lindahl and Folkesson (2012), "the computer can be considered either a friend or foe" in preschool education. Preschool student teachers underline the three main areas that the computer strengthens: the child as citizen, the child as an active explorer, and the competent child (Lindahl & Folkesson, 2012). These three roles are intertwined, and it is clear that preschool education is committed to enriching these roles and preparing children for being citizens with an active and crucial role in society. During preschool education, children understand values and develop competences in terms of skills, knowledge and critical understanding, so it is vital to prepare them at this stage in their lives for civic participation (Tomé et al., 2019). Interestingly, Lindahl and Folkesson (2012) found that if children cannot use the computer independently, the computer is considered a foe. Thus, this calls for flexibility in the teacher's role regarding the degree of control over activities and illustrates that preschool teachers and children should rediscover the meaning and possibilities of learning and development through the introduction of new tools such as computers. Furthermore, Heather et al. (2018) found that

teacher mediation with computers may be more useful when children are just beginning to learn new concepts and less beneficial as they become more able.

Zevenbergen and Logan (2008) argue that young people that have grown up in a society, where digital technology has been an integral part of their lives are called "digital natives" (Prensky, 2001a, 2001b), "Generation Y" or "millennials", attributing to this generation distinct characteristics that differentiate them from previous generations. Even if this applies to older children, it is clear that young children coming into the early childhood settings may also be different from other generations because of the social and technological conditions within which they are developing (Zevenbergen & Logan, 2008). Some basic characteristics of these digital natives are, firstly, that communication is being experienced in a completely new way since children today are more connected and are also targeted by marketers to a much greater extent than any other generation. Secondly, this generation has grown up in times, where the potential for instant feedback (and gratification) is nearly always part of their interactions. The speed from action to effect means that young children process information quickly (Zevenbergen & Logan, 2008). Thirdly, multitasking is a characteristic that defines this generation and observational data indicate that young people are prone to multitask in ways that were not possible for their parents (Zevenbergen & Logan, 2008). All these characteristics, besides influencing children's development, also influence the way children learn.

Focusing exclusively on research with preschool children[1] shows that digital technologies should be used as a complement to other traditional activities at this stage of child development, providing a wider range of experiences for young children. Early engagement with touch screen technologies can help foster the development of digital literacy skills (Price et al., 2015).

## Children's Drawings as a Medium of Representation

Drawings are a form of communication. They are interactive, visual expressions of ideas and a means of creating meaning. While acknowledging that representations such as drawings have a "material reality," we also recognize children's drawings as representations of their worlds (Baroutsis et al., 2019; Einarsdottir et al., 2009). Drawings provide insight into a child's worldview and can provide a "window" into thoughts and feelings. They have an intimate language (Oksuz et al., 2015). Furthermore, drawing can act as a tool for expressing affective information. When a child draws, their subconscious wishes, feelings, and perceptions of the world can be seen through the drawing (Hurst, 2017). Thus, Freud and Jung, the pioneers of modern psychology, emphasized the relations between symbols, paintings and personality. Freud noted that images, which belong to suppressed memories can be expressed by dreams and art (Oksuz et al., 2015). What a child draws is influenced by both internal (e.g., biological features, maturity, age, intelligence, motivation, etc.) and external factors (e.g., social environment and socio-economic and cultural level) (Hurst, 2017). As such, we acknowledge that drawings are not neutral. Drawings serve

as a personality shaper and form a basis for intellectual and emotional development. Expressing oneself through artistic activities is compared to play as a need of developmental age. Sketching free forms of straight lines, curves, spirals and zigzags is a natural need of human beings (Wiśniewska, 2017).

Children's drawings as cultural product and testimony of true or false (Eco, 1989) reveal how children are influenced by the environment they engage with daily (Golia et al., 2009). Like adults, children communicate meaning in art through the use of signs that "stand for" other things, which become "text" that can be "read". In the representation as a process, the child or the adult seeks to make a representation of some object or entity. The interest in the object at the point of making the representation arises out of the cultural, social and psychological history of the sign-maker, the child in this case, and is focused by the specific context in which the child produces the sign (Kress & van Leeuwen, 2006). Reading art generally involves interpreting "abstractable and combinatory" elements, such as lines, shapes, proportions, colors, shadings, composition and perspective (Wright, 2007, p. 2). Children's drawings can be influenced by what others draw or say, and the meanings ascribed to drawings may be co-constructed by the participants in the drawing experience (Einarsdottir et al., 2009).

The view of childhood has changed in recent decades and the ideology of a child-centered society gives the "child" a prominent place in policy and practice. In this way, children are encouraged to talk about their views, knowledge and opinions. Collecting their knowledge is a further step in decoding their viewpoint on society and to hearing new insights, which can inform adults' understanding of current issues (Dunn et al., 2018).

Moreover, gathering their knowledge on the major role touchscreens play in their life inform us on the way they relate to society. Though children grasp the multifunctional nature of touchscreen devices, they are still developing this understanding. They do not fully recognize the capabilities of touchscreens and tend to prioritize certain functions, such as playing games and watching shows, over other functions, like learning. They do this because they probably think egocentrically about touchscreens and believe that a device's purpose aligns with their own primary use of the device, which is to play games (Eisen & Lillard, 2016). Vygotsky's classical argument that children's concepts do not develop independently, but through social interaction applies, according to Mertala (2019), to learning about digital technologies. That is to say that intentional or unintentional tutoring by parents or siblings helps children construct meaning about the information they receive (Mertala, 2019). Furthermore, data collection methods play a role in shaping children's concepts (Mertala, 2019).

Even though a number of studies have revealed young children's intensive interaction with information and communication technologies from a broad perspective (Konca & Tantekin Erden, 2021), the study presented here takes a child-centered approach that sheds light on the way children depict various conceptions of PC and the role and meaning

---

[1] Preschool children in this article refer to children aged four to six years old.

computers play in their lives. Moreover, it employs a child-friendly method that focuses on the child and its needs as well as its competences. As children's viewpoint is crucial in shaping their views and computer use has rapidly expanded over the last decade, this paper examined children's conceptions of the PC as well as the meaning they attribute to it. In sum, the present research aimed to answer the following main questions:

**RQ1.** What conceptions do kindergarten children have about computers?

**RQ2.** What is the meaning of the computer in the drawings of kindergarten children?

## METHODOLOGY

According to Mertala (2019), children's drawings give adults a chance to glimpse their thinking and understanding of the world. Furthermore, the use of drawings is considered a child-centered data collection method, as it is an enjoyable and beneficial activity for most children (Mertala, 2019). When children are interviewed about their drawings, this combination of visual and verbal narration is further strengthened as the drawing creates a space, where ideas flourish and are expressed in a concrete way (Mertala, 2019).

The present study, as part of a more expansive research project (Theodosiadou & Kyridis, 2022a, Theodosiadou & Kyridis, 2022b), focuses on one of the three open-ended questions of the questionnaire that was delivered in preschoolers of three kindergartens of Thessaloniki. The questions asked preschoolers to draw their ideas about TV, their ideal TV and computers; 70 preschoolers responded to the questions. Each child drew one drawing for each question. The questions were designed to be as open-ended and non-descriptive as possible because the way questions are asked influence children's explanations (Mertala, 2019). The mini interviews were conducted by the kindergarten teachers who asked the young children the open ended question of the research project "What is computer for you? Draw your ideas on computer in the space provided"and then she wrote down to each drawing the answers of the children. The school was a kindergarten in the east side of Thessaloniki, Kalamaria, a highly populated, quite wealthy neighbourhud with 25 preschoolers both boys and girls and two well experienced kindergarten teachers. 21 codes were formed, and drawings were analyzed according to them based on the model of Kress and van Leeuwen (2006).

It is significant to note that the role of the kindergarten teachers in this research process was to collect the drawings and the description of the drawing of the children. The teachers were provided with detailed guidance on the aim, the scope and the methodology of the research as well as the way the data would be used. The methodology applied in this study tried to combine both the qualitative richness of the drawings and the mini interview that each child gave to the teacher about his/her drawing, but at the same time to test certain variables and their association to the drawings. The method



**Figure 1.** "My PC will show my friends playing on *Shopping Star* show & me turning magically into a fairy, a princess, a mermaid" (Source: Research questionaire)

design was qualitative and quantitative analysis of the drawings and discourse analysis of the words of the children (Theodosiadou & Kyridis, 2022a, Theodosiadou & Kyridis, 2022b). This study is based on a mixed model of analysis, on the grammar of visual design (Kress & van Leeuwen, 2006; van Leeuwen, 2005) through a critical analysis (Chouliaraki & Fairclough, 1999). In our analysis, we used a socio-semiotic framework based on Rose's (2007, p. 12) argument that "visual representations have their own effects," was along with a descriptive statistical analysis of the data and a content analysis of the children's justifications. The analysis consisted of social semiotic analysis of the content of the actual drawings according to Kress and van Leeuwen (2006), as well as discourse analysis of the words of the preschoolers with which they described their drawings. The data were also analyzed quantitatively (Theodosiadou & Kyridis, 2022a).

## FINDINGS

The concept of the computer is associated in the drawings of children with entertainment and in particular with television entertainment programs as mentioned in a caption of a child's drawing: "My PC would show my friends doing *Shopping Star* [2] and me turning into a fairy, a princess, a mermaid" (**Figure 1**).

---
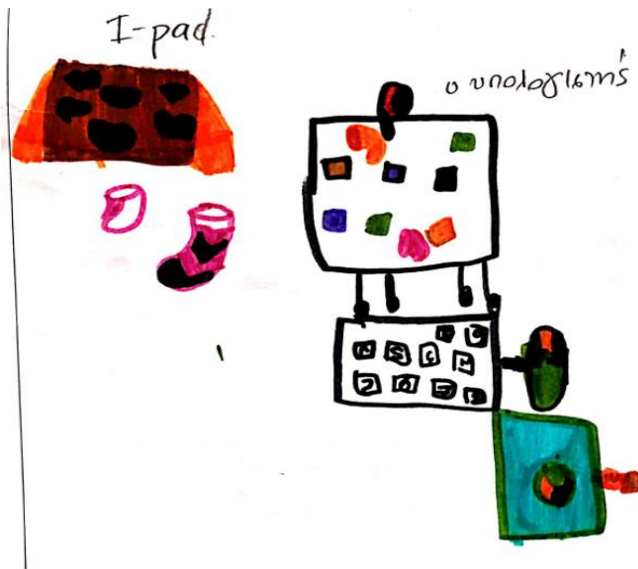
[2] A popular TV show that has to do with fashion.
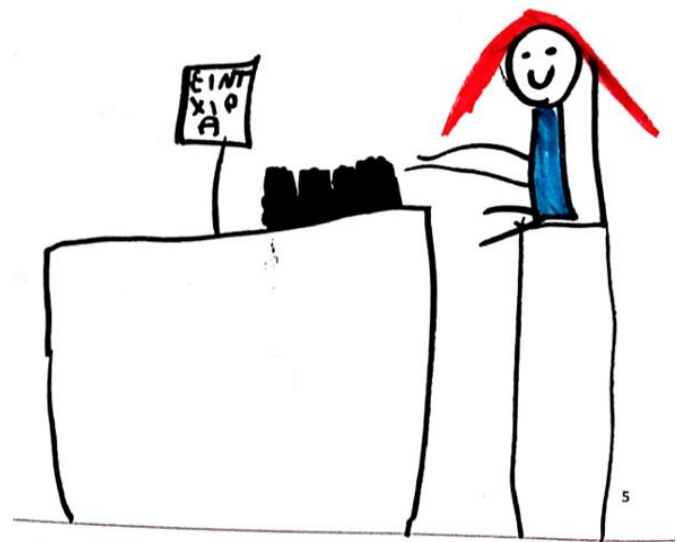
**Figure 2.** "I-pad: PC" (Source: Research questionaire)



**Figure 4.** "On my computer, you can write letters" (Source: Research questionaire)

image of the work-related PC, work that is also blended with entertainment. In particular, "It is a PC that people use for work. Work that is important such as downloading a movie, playing a game that we download in our PC and in acting this way we do not have time to play with our toys" (**Figure 2**).

Additionally, the PC is described as a device with superpowers as "It will have many buttons and it will do all the things I am asking it to do"; "It will teach us a great variety of languages"; "You will be able to order whatever you feel like"; "It will order the printer to print the image of the beach"; and finally, "My PC writes by itself whatever it wants" (**Figure 3**).

Moreover, the PC in the children's eyes works as an encyclopedia, "as it is a device, and it answers our questions. I find answers to my question on the PC. The PC has letters for questions." Plus, it is seen as a helping hand for children's classes: "The PC is used to do our math and for dad to check out things for his work," but at the same time "it is used to have fun, to learn about letters and dinosaurs." The kindergarten children's description of the PC indicates they recognize the power the PC has in their life today (**Figure 4**).

In many children's drawings, the PC is portrayed as an object with "multiple buttons," "a tablet," "a TV," "a laptop," "a mobile phone," "a keyboard," "a screen", or even an object with human characteristics; that is to say, "It will have many buttons and will be naughty around the home." Or it is an object that has developed skills (**Figure 5**): "A box that whatever you write on it with buttons, it shows it to you."



**Figure 3.** "The PC will show me what a beach looks like" (Source: Research questionaire)

The computer is also linked with children's programs (children's shows, movies, series, etc.) and games as well as video games: "I use the PC to play games. This is good because it is a pleasure for me to play games. I play a game with Tarzan." Furthermore, the PC is also identified as a visual storyteller, e.g., "The PC here shows that a kid is in a tube and the water comes and makes a hole in the tube. This means that I enjoy watching this story on the PC." Sometimes the child connects itself with a simulation game that it usually plays on the PC: "The PC is for me to watch cars. I am inside the PC, and I am driving." On the other side of entertainment lies the

Sometimes the PC is regarded as a member of the child's family or as a person with a particular name: "My PC's name is Katerina," or as a person with certain skills: "a tiny witch." At other times, the PC is depicted as a season, such as Christmas. More specifically, the caption of the child reads: "I have drawn a Christmas PC. This means it is a Christmas year. That is to say when they press its buttons, they open it and it has Christmas look and, in that way, everyone understands that Christmas and New Year are on the way." In other drawings, the PC evokes positive or negative emotions. They are positive emotions when the child learns something from the PC: "The use of the PC is to learn new things.
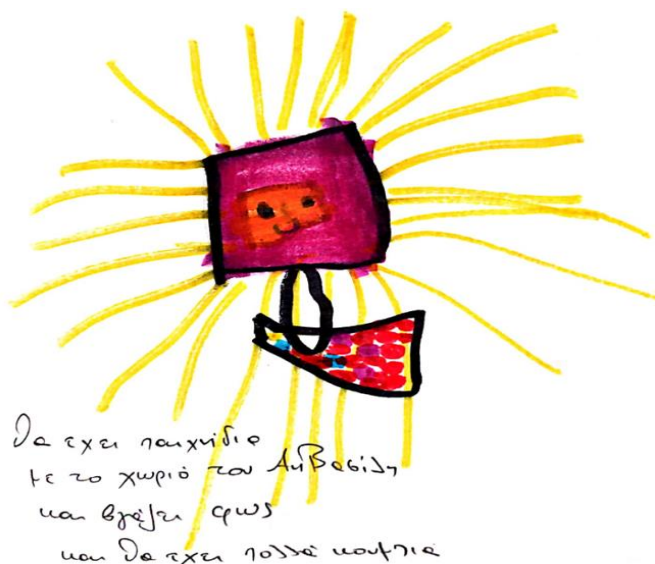
Θα εχει παιχνιδια τε το χωριο του ΑιΒασιλη και βγαζει φως και θα εχει πολλα κουμπια

**Figure 5.** "My PC will have games with Santa's village & a lot of light as well as many buttons" (Source: Research questionaire)



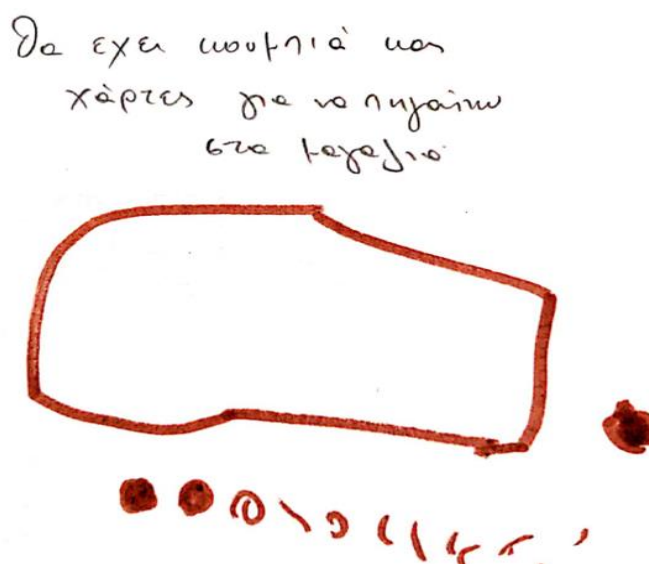Θα εχει κουμπια και χαρτες για να πηγαινω στα ψωνια

**Figure 7.**"It will have buttons & maps so that I can go shopping" (Source: Research questionaire)



Ζωγράφισε τις ιδέες σου για τον ηλεκτρονικό υπολογιστήστον παρακάτω χώρο.

Η καρέκλα της μαμάς

Η αδεια καρεκλα του μπαμπα

**Figure 6.** "Mum's chair & dad's empty chair" (Source: Research questionaire)



ο υπολογιστης

εγω

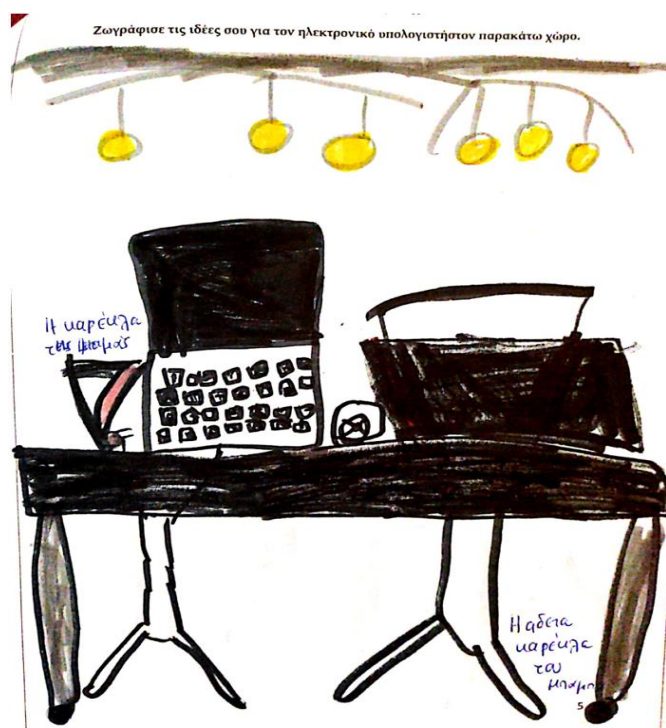**Figure 8.** "I drew my PC & myself" (Source: Research questionaire)

This is happiness for me," and there are negative emotions when dad becomes so immersed and forgets about the child: "The PC is used so that dad can download a movie. This means that dad can not spend time with me because he is busy." In a caption, the kindergarten child says emphatically: "Mum's chair. Dad's empty chair" (**Figure 6**).

88.7% of preschoolers code the topic of the computer's representation in their drawings and depict the special relationship they have with computers. A very small percentage (11.3%) draw the computer as the sole figure in their drawings; 98.6% of preschoolers include objects in their drawings that are part of the home décor and related in some
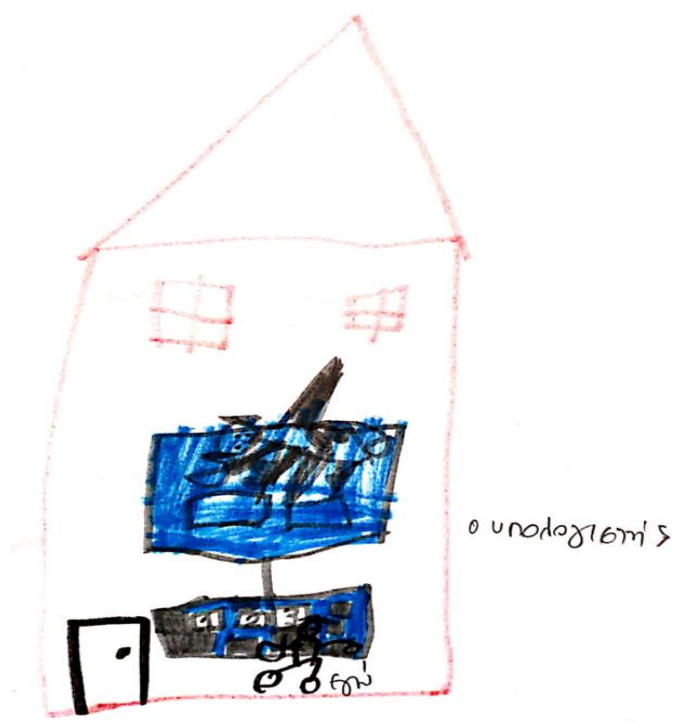
way to the computer; and 59.2% include figures in their drawings (**Figure 7**).

These are mainly children's figures of both sexes and in some cases figures that are represented on the computer screen. The clarity, the completeness and the consistency of the figures is relatively high in the preschoolers' drawings at a rate that exceeds 50.0%.

A 47.1% rate of preschoolers that participated in the research as far as the scenario of the drawing is concerned use narration procedures that are connected with the particular narrative, presenting ongoing actions and facts (e.g., **Figure 8**).

**Figure 9.** "My PC shows dancing & tells news" (Source: Research questionaire)

Visual structures do not simply reproduce the structures of "reality" but produce images of reality, which are connected to the interests of the social institutions within which the images are produced, circulated and read. Visual structures are ideological and have a deeply important semantic dimension (Kress & van Leeuwen, 2006). Moreover, this percentage shows that preschoolers represent the world "narratively"–that is in terms of "doing" and "happening" and this is certainly in line with preschool age. The same percentage of preschoolers use analytical processes in the scenario of the drawing that relate participants in terms of a part-whole structure (Kress & van Leeuwen, 2006, p. 87). Regarding the interpersonal mode of the drawing, there is no direction of the eyes in the figures that are depicted in the drawings in 52.1%, whereas in 43.7% of the drawings, the painting is a close-up capture. A rate of 47.9% of the preschoolers' drawings are made from a low vantage point (looking up) and the relationship to power is obvious, as preschoolers see the computer as something on which they cannot impose themselves.

Almost three-quarters (74.6%) of the drawings are colorful with bright, vivid colors, whereas a much lower percentage of drawings are single-colored or black-and-white. It has been suggested that there is a reciprocal interaction between color and emotion, with particular feelings being associated with color, and the combination of cognition that affects all bringing memories, feelings, and emotions to the forefront. Generally, it is believed that bright colors emphasize positive qualities and dark colors emphasize negative qualities. (e.g., **Figure 6** & **Figure 7** are representative examples of bright and prominent colors). The colors of toys, drawing and coloring behaviors, and the language used within the environment may all contribute towards a child's emotional literacy and understanding. The way that color is used within drawings can reflect and emphasize particular emotional states or qualities of the artist, with children using color in their artwork as a means of expressing their underlying emotional state (Pope et al., 2012).

At least 78.9% of the depicted objects in the preschoolers' drawings are strongly framed and are presented as belonging together, having a sense of connectedness (**Figure 9**). In a significantly lower percentage of the drawings (22.5%), there is no object in the drawing that represents a computer that is

**Table 1.** Semantics

| Semantics | Class | | | |
| | 1 | | 2 | |
| | n | % | n | % |
|---|---|---|---|---|
| 1 | 3 | 42.9 | 5 | 7.8 |
| 3 | 4 | 57.1 | 59 | 92.2 |
| Total | 7 | 100 | 64 | 100 |

**Table 2.** Clarity

| Clarity | Class | | | |
| | 1 | | 2 | |
| | n | % | n | % |
|---|---|---|---|---|
| 0 | 6 | 85.7 | 20 | 31.3 |
| 1 | 1 | 14.3 | 37 | 57.8 |
| 2 | 0 | 0.0 | 7 | 10.9 |
| Total | 7 | 100 | 64 | 100 |

**Table 3.** Completeness

| Completeness | Class | | | |
| | 1 | | 2 | |
| | n | % | n | % |
|---|---|---|---|---|
| 0 | 6 | 85.7 | 19 | 29.7 |
| 1 | 1 | 14.3 | 39 | 60.9 |
| 2 | 0 | 0.0 | 6 | 9.4 |
| Total | 7 | 100 | 64 | 100 |

selected as more important and more worthy of attention than the other elements of the drawing (salience).

In the majority of the preschoolers' drawings (77.5%), the reading of the drawings is linear; that is to say, the child-creator is leading us to the way to read the drawing. This is a strictly coded way of expressing their thoughts. Such texts must be read the way they are designed to be read – from left to right and from top to bottom, line by line. If the reading path is linear and horizontal, it constitutes a progression, moving inexorably forward towards the future. If it is vertical, a sense of hierarchy is signified, a movement from the general to the specific, from the "headline" to the "footnote." The shape of the reading path itself conveys a significant cultural message (Kress & van Leeuwen 2006, p. 205). In just over half of the children's drawings (52.1%), the important element is in the center of the drawing, whereas the secondary elements are in the margins. A sense of permanence goes with the central position as well as the fact that the dominant image holds the center of the children's drawing (Kress & van Leeuwen, 2006). Consequently, the argument that preschoolers depict the object of the computer as crucial and unique in comparison to the rest of the details in the sketches is further strengthened.

We carried out Chi-square test to find any statistically significant differences between the social characteristics of the sample and the quantitative analysis of the children's drawings. More specifically, Chi-square test check found that the semantics that appear in the children's drawings are dependent with a significant statistical difference from the class in which the preschoolers were at ($x^2$=7.75, df=1, p<0.005) (**Table 1**).

Subsequently, the clarity ($x^2$=8.11, df=2, p≤0.017) is shown in **Table 2**.

Completeness ($x^2$=8.72, df=2, p≤0.013) is shown in **Table 3**.

**Table 4.** Consistency

| Consistency | Class | | | |
|---|---|---|---|---|
| | 1 | | 2 | |
| | n | % | n | % |
| 0 | 6 | 85.7 | 20 | 31.3 |
| 1 | 1 | 14.3 | 40 | 62.5 |
| 2 | 0 | 0.0 | 4 | 6.3 |
| Total | 7 | 100 | 64 | 100 |

**Table 5.** Scenario

| Scenario | Class | | | |
|---|---|---|---|---|
| | 1 | | 2 | |
| | n | % | n | % |
| 0 | 0 | 0.0 | 1 | 1.6 |
| 1 | 1 | 16.7 | 32 | 50.0 |
| 2 | 2 | 33.3 | 31 | 48.4 |
| 4 | 3 | 50.0 | 0 | 0.0 |
| Total | 7 | 100 | 64 | 100 |

**Table 6.** Objects

| Answer | n | % |
|---|---|---|
| Yes, the PC is represented as a particular object in the children's drawings | 70 | 98.6 |
| No, the PC is not represented as a particular object in the children's drawings | 1 | 1.4 |
| Total | 71 | 100 |

**Table 7.** Images

| Answer | n | % |
|---|---|---|
| Yes, the computer is represented as a particular figure in the children's drawings | 42 | 59.2 |
| No, the computer is not represented by any particular figures in the children's drawings | 29 | 40.8 |
| Total | 71 | 100 |

And consistency ($x^2$=8.09, df=2, p≤0.018) of the figures in the children's drawings is influenced by the class (**Table 4**).

In addition, when the scenario and the class were correlated, a significant statistical difference was found, as the class influences the scenario of the children's drawing ($x^2$=33.65, df=3, p≤0.001) (**Table 5**).

**Table 6** shows whether or not the children's representation of a computer is a certain object. Yes depicts "Yes, PC is represented as a particular object in the children's drawings" and no depicts "No, PC is not represented as a particular object in the children's drawings." The distribution on the table shows that 98.6% of the preschoolers depict it as an object on their drawing and only 1.4% do not draw an object when they are asked to draw what a computer is for them.

**Table 7** shows whether or not children's representation of computers are certain figures. Yes depicts "Yes, the computer is represented as a particular figure in the children's drawings" and no depicts "No, the computer is not represented by any particular figures in the children's drawings." The distribution on the table shows that 59.2% of the preschoolers depict a figure on their drawing and only 40.8% do not represent the computer on their drawings with a particular figure.

**Table 8** shows the relationship between the authority that TV represents and children. Eye-level depicts that the drawing of the PC is made at eye-level, high depicts that the drawing of

**Table 8.** Relationship to authority

| Relationship between the authority that TV represents and children | n | % |
|---|---|---|
| Eye-level | 14 | 19.7 |
| High | 23 | 32.4 |
| Low | 34 | 47.9 |
| Total | 71 | 100 |

the PC is made from a high perspective and low depicts a low perspective. The distribution on **Table 8** shows that 47.9% of preschoolers see computers from a low perspective, 32.4% from a high perspective and only19.7% as equals from eye-level.

# DISCUSSION

There is a high degree of cohesion among most of the qualitative and quantitative results of the study. The computer in the eyes of kindergarten children is described through five main dimensions. The first one is the concept of entertainment, which includes TV programs, games of all kinds, themselves inside the computer playing those games, and the actual content of a TV program, such as storytelling. The second concept arising from the children's drawings is the concept of a device with multiple admirable characteristics. This particular device has superpowers, functions like an encyclopedia but can also be used for the benefit of students as it can be a helping hand in their lessons. This second concept is reinforced by 52.1% of the children's drawings that place the PC in the center of their drawings; 74.6% that use vivid and blatant colors to depict it; and 47.9% that confront/look at it from a low angle. Likewise, the third concept that results from the children's drawings is the computer as an object that has "multiple buttons" and other external characteristics. In 98.6% of the drawings, children included objects that look like a computer or are associated with a computer, as they also say in their captions. The fourth concept is the personalization of the computer especially through members of their family; in 59.2% of the drawings, the computer is being described as a figure, a clear figure at a rate that exceeds half of the kindergarten children. The fifth concept is emotions, as the computer is associated with both positive (such as the Christmas season) and negative emotions (the dad's empty chair).

Both the qualitative and quantitative results indicate children perceive the computer as something very powerful, with a power that is alien to them and that is the reason almost half of the preschoolers draw it from a low vantage point. Furthermore, they consider the PC to have multiple functions but also multiple faces, and in tune with that in their drawings they draw a couple of things that represent the PC and not a certain object that stands out.

This multidimensionality that preschoolers recognize in the computer is also obvious through the sum of the results in this study. Greek preschoolers see the PC through external features such as "a device with superpowers," "an object with many buttons," but also through internal features, such as emotions and persons. They also attribute to the PC the capacity for entertainment that it offers as they mainly see it

as a way of having fun. This is quite a holistic approach to describing the computer. Young children realize how significant the role of the computer is in their lives and they draw the chairs of their parents to depict the absence they feel when dad is missing, or he does not spend time with them because he is busy with the PC. They also admire the abilities of the PC as it can teach them many things, order for them or write for them, and in many ways make life easier for them.

It is important to stress that the class influences the figures, the characteristics of the figures (clarity, completeness, and consistency) but also the scenario of the drawings. In other words, this means that age is a crucial factor that shapes the way children depict the idea of the computer as well as the narration behind the drawing. A quite interesting finding is the fact that the area influences the relationship to authority. Even though Kalamaria, where the research took place, is a prosperous district in Thessaloniki, preschoolers observe the authoritarian computer from afar.

## CONCLUSIONS

Children's drawings are an interpretation of their feelings and also a reflection of the sociocultural world of adults (Zakaria et al., 2021). However, children's drawings depict their views of the world. Children's drawings are affected by their drawing skills, their knowledge of visual cultural codes in the world around them and especially by the kind of relationships the children have with the adults issuing the instructions for the drawing activity (Søndergaard & Reventlow, 2019).

This study demonstrated that the concepts preschool children have of computers vary in content and intensity. Regarding the first research question, the main concept that is being addressed through children's drawings is the multidimensionality of the PC. The computer is being depicted as an object with multiple buttons that serves both work and entertainment.

In terms of the second research question, preschool children give to the computer the meaning of a super-powerful being which, though they admire it for its abilities, they still keep a cautious distance from it as the way they are rendered in the drawings would testify. They certainly attribute mostly positive qualities to the computer and realize the key role that it plays in their life. These findings are aligned with the attitude of preschool children towards TV (Theodosiadou & Kyridis, 2022a), where almost half of preschool children (48.6%) looked at TV as a superpower, since they draw it from a low vantage point (Theodosiadou & Kyridis, 2022a).

This study reveals that children have a very realistic image of computers and the core role it plays in their everyday life. As a consequence, parents and teachers should take this standpoint into account and encourage children to invest their time on the computer screen creatively and help familiarize them with this aspect of computers that children still find difficult to grasp.

The current findings should be interpreted in light of some limitations and directions for future research. One notable limitation is the homogeneity of the convenience samples; the children's samples are not representative of the general population, limiting generalizability of the findings.

Further research could enrich the sample of the preschoolers and the variety of screen media used to clarify the contradictory relationship between children and computers. Furthermore, future research could also study the degree of power in the relationship between children and computers and should also explore how to optimize computer use for them.

## REFERENCES

Baroutsis, A., Kervin, L., Woods, A., & Comber, B. (2017). Understanding children's perspectives of classroom writing practices through drawings. *Contemporary Issues in Early Childhood, 20*(2), 177-193. https://doi.org/10.1177/1463949117741743

Cetintas, H. B., & Turan, Z. (2018). Through the eyes of early childhood students: Television, tablet computers, internet and smartphones. *Central European Journal of Communication, 11*(1), 56-70. https://doi.org/10.19195/1899-5101.11.1(20).4

Chouliaraki, L., & Fairclough, N. (1999). *Discourse in late modernity: Rethinking critical discourse analysis.* Edinburgh University Press.

Dong, C. (2018). 'Young children nowadays are very smart in ICT'–Preschool teachers' perceptions of ICT use. *International Journal of Early Years Education.* https://doi.org/10.1080/09669760.2018.1506318

Dong, C., & Newman, L. (2016). Ready, steady ... pause: Integrating ICT into Shanghai preschools. *International Journal of Early Years Education, 24*(2), 224-237. https://doi.org/10.1080/09669760.2016.1144048

Dore, R. A., & Dynia, J. M. (2020). Technology and media use in preschool classrooms: Prevalence, purposes, and contexts. *Frontiers in Education, 5*. https://doi.org/10.3389/feduc.2020.600305

Dunn, J., Gray, C., Moffett, P., & Mitchell, D. (2018). 'It's more funner than doing work': Children's perspectives on using tablet computers in the early years of school. *Early Child Development and Care, 188*(6), 819-831. https://doi.org/10.1080/03004430.2016.1238824

Eco, U. (1989). *Theory of semiotics* (Trans. E. Kallifatidi). Knowledge.

Einarsdottir, J., Dockett, S., & Perry, B. (2009). Making meaning: Children's perspectives expressed through drawings. *Early Child Development and Care, 179*(2), 217-232. https://doi.org/10.1080/03004430802666999

Eisen, S., & Lillard, A. S. (2016). Just Google it: Young children's preferences for touchscreens versus books in hypothetical learning tasks. *Frontiers in Psychology, 7*, 1431. https://doi.org/10.3389/fpsyg.2016.01431

Gardasevic, J., Bjelica, D., Popovic S., & Vasiljevic, I. (2015). Attitudes of parents of preschool children towards the frequency and aspects of the use of computers. *Journal of Physical Education and Sport, 15*(3), 479-483.

Golia, P., Vamvakidou, I., & Traianou, E. (2009). History and semiotics: Children are drawing "Homeland". The *International Journal of Learning, 16*(2), 321-332. https://doi.org/10.18848/1447-9494/CGP/v16i02/46152

Hadad, S., Meishar-Tal, H., & Blau, I. (2020). The parents' tale: Why parents resist the educational use of smartphones at schools? *Computers & Education*, *157*, 103984. https://doi.org/10.1016/j.compedu.2020.103984

Heather C., Janisse, H. C., Li, X., Bhavnagri, N. P., Esposito, C., & Stanton, B. (2018). A longitudinal study of the effect of computers on the cognitive development of low-income African American preschool children. *Early Education and Development, 29*(2), 229-244. https://doi.org/10.1080/10409289.2017.1399000

Hurst, E. H. (2017). *Understanding social identity through children's drawings: Where is your happy place?* [Master's thesis, University of Tennessee, Knoxville].

Konca, A. S., & Tantekin Erden, F. (2021). Digital technology (DT) usage of preschool teachers in early childhood classrooms. *Journal of Education and Future, 19*, 1-12. https://doi.org/10.30786/jef.627809

Kress, G., & van Leeuwen, T. (2006). *Reading images: The grammar of visual design*. Routledge. https://doi.org/10.4324/9780203619728

Lindahl, M. G., & Folkesson, A.-M. (2012). ICT in preschool: Friend or foe? The significance of norms in a changing practice. *International Journal of Early Years Education, 20*(4), 422-436. https://doi.org/10.1080/09669760.2012.743876

Marklund, L. (2020). Swedish preschool teachers' experiences from pedagogical use of digital play. *Journal of Early Childhood Education Research, 9*(1), 171-193.

Mertala, P. (2019). Young children's conceptions of computers, code, and the Internet. *International Journal of Child-Computer Interaction, 19*, 56-66. https://doi.org/10.1016/j.ijcci.2018.11.003

Oksuz, Y., Guven, E., Baba, M., & Kartal, A. (2015). Investigating primary school students' perceptions about differences through their drawings. *Turkish Studies, 10(3)*, 529-544.

Otterborn, A., Schönborn, K., & Hultén, M. (2018). Surveying preschool teachers' use of digital tablets: General and technology education related findings. *International Journal of Technology and Design Education, 29*(4), 717-737. https://doi.org/10.1007/s10798-018-9469-9

Prensky, M. (2001a). Digital natives, digital immigrants part 1.. *On the Horizon, 9*(5), 1-6. https://doi.org/10.1108/10748120110424816

Prensky, M. (2001b). Digital natives, digital immigrants part 2: Do they really think differently? *On the Horizon, 9*(6), 1-6. https://doi.org/10.1108/10748120110424843

Prensky, M. (2004). *The emerging online life of the digital native: What they do differently because of technology, and how they do it.* https://www.bu.edu/ssw/files/pdf/Prensky-The_Emerging_Online_Life_of_the_Digital_Native-033.pdf

Price, S., Carey, J., & Crescenzi, L. (2015). The role of iPads in pre-school children's mark making development. *Computers & Education, 87*, 131-141. https://doi.org/10.1016/j.compedu.2015.04.003

Pope, D. J., Butler, H., & Qualter, P. (2012). Emotional understanding and color-emotion associations in children aged 7-8 years. *Child Development Research*, *2012*. https://doi.org/10.1155/2012/975670

Prensky, M. (2009). H. sapiens digital: From digital immigrants and digital natives to digital wisdom. *Innovate: Journal of Online Education,* 5(3), Article 1. https://nsuworks.nova.edu/innovate/vol5/iss3/1

Rose, G. (2007). *Visual methodologies: An introduction to researching with visual materials*. SAGE.

Rücker, M. T., & Pinkwart, N. (2016). Review and discussion of children's conceptions of computers. *Journal of Science Education and Technology, 25*, 274-283. https://doi.org/10.1007/s10956-015-9592-2

Søndergaard, E., & Reventlow, S. (2019). Drawing as a facilitating approach when conducting research among children. *International Journal of Qualitative Methods, 18*, 160940691882255. https://doi.org/10.1177/1609406918822558

Theodosiadou, S., & Kyridis, A. (2022a). Making sense of the image of TV in Greek preschoolers' drawings. *Journal of Early Childhood Research*, *20*(1), https://doi.org/10.1177/1476718X211045731

Theodosiadou, S., & Kyridis, A. (2022b). Greek preschoolers drawing the TV of their dreams, *Media Education*, *13*(2), 42-58. https://doi.org/10.36253/me-11514

Theodosiadou, S., & Markos, A. (2013). Attitudes of preschool teachers in Northern Greece on children and TV viewing. *Australasian Journal of Early Childhood*, *38*(3), 36-44. https://doi.org/10.1177/183693911303800306

Tomé, V., Lopes, P., Reis, B., & Dias, C. P. (2019). Active citizenship and participation through the media: A community project focused on pre-school and primary school children. *Comunicação E Sociedade* [*Communication and Society*]*, 36*, 101-120. https://doi.org/10.17231/comsoc. 36(2019).2347

Van Leeuwen, T. (2005). *Introducing social semiotics*. Routledge.

Vasiljevic, I., Bjelica, D., Popovic, S., & Gardasevic, J. (2015). A critical review of parents of preschool children related to computer use. *Journal of Physical Education and Sport, 15*(4), 692-696.

Wiśniewska, A. (2017). Drawings by children aged 3-12 in the context of new media. *Cognitive Science–New Media–Education, 2*(1), 129-139. https://doi.org/10.12775/csnme. 2017.008

Wright, S. (2007). Graphic-narrative play: Young children's authoring through drawing and telling. *International Journal of Education & the Arts, 8*(8), 1-28.

Zakaria, M. Z., Yunus, F., & Mohamed, S. (2021). Drawing activities enhance preschoolers socio emotional development. *Southeast Asia Early Childhood Journal, 10*(1), 18-27. https://doi.org/10.37134/saecj.vol10.1.2.2021

Zawacki-Richter, O., & Latchem, C. (2018). Exploring four decades of research in computers & education. *Computers & Education, 122*, 136-152. https://doi.org/10.1016/j. compedu.2018.04.001

Zevenbergen, R., & Logan, H. (2008). Computer use by preschool children: Rethinking practice as digital natives come to preschool. *Australasian Journal of Early Childhood, 33(1)*, 37-44.https://doi.org/10.1177/183693910803300107