Chapter 13
Teaching Visual Arts with Digital Technologies

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13.1 Introduction

The widespread use of technology and the contemporary social reality of multiple and ambiguous stimuli, particularly visual ones (Freedman 2003), have had an impact on the ways that the field of visual arts (VA) is taught. New frameworks underline the need of integrating digital technologies in visual arts (VA) from a young age in order for tomorrow's citizens to become critical image viewers (Anderson and Melody 2005) and creators (Raptis and Rapti 2006). In line with these new frameworks, this study will present an efficient way of incorporating digital technologies to further enhance children's learning and creative engagement with visual arts. Findings from this study are significant for future research in this area as the use of digital technologies grows rapidly and children are infused into a rich visual world from a very young age.

Few studies have investigated how primary school students' use of technology is incorporated into teaching visual arts. Older projects investigated the creation of graphic designs through program coding (Wohlwill and Wills 1988) or the use of special software (e.g., image processing, special effects, photo editing, etc.) in teaching visual arts (Chia and Duthie 1993). More recently, studies have examined the helpful use of computers in providing rich databases of digitized visual artworks of famous artists for older students to explore (Haydn and Counsell 2003) or as a virtual environment where students could virtually visit museums and galleries around the world (Gerlich and Perrier 2003). At the same time, studies in primary

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education have explored the effectiveness of computer use as a teaching visual aid (e.g., presenting famous artworks to young students) or as a storage means (e.g., notebooks, CDs, web servers) for saving students' pieces of art (Ngan et al. 2003).

A different line of inquiry (the interdisciplinary approach) examined the use of technology in VA in order to support other school subjects. Findings suggested positive learning outcomes, for example, learning foreign languages when virtual environments of sightseeing were visited or pieces of ethnic art were admired (New York State Education Department [NYSED], 2010). A positive impact on mathematics learning also was shown in activities that involve programming and designing geometric shapes of art culture (Hinshaw 2001). However, the use of a digital, educational application that involves interactive activities of viewing and interpreting artworks that aim at a more holistic and active engagement with VA has not attracted a lot of interest from the research community so far.

13.2 Visual Arts and the Benefits for Education

When students are involved in visual art projects, they understand the concept of visual literacy. Visual literacy has two expressions: children (a) communicate easily by creating visual and optical forms, and (b) they become active and critical image readers (Arnheim 1969; Mesa 2005). Visual literacy is particularly important in the context of contemporary visual culture (Freedman 2003), where communication has increasingly acquired a visual character. Visual literacy allows students to evaluate, interpret, and selectively use the abundance of visual information they receive daily. These are essential skills that, according to Eisner (2001), an individual must acquire in order to be an educated and functioning adult in society.

Studies show that pleasurable visual experiences of observation and critical art viewing, as well as visual art creation, strengthen the educational process, regardless of the age of the student. Rich visual, tactile, and kinesthetic experiences assist with developing and expanding students' physical and perceptual abilities (Zeki and Bartels 1999). These experiences also promote imagination, ingenuity, and creativity of students, who gradually realize the meaning of all those existing around them (Freedman 2003; Marshall and Vashe 2008). Finally, according to Gardner (2006), these experiences enhance the diversity of human thought, thus promoting the holistic development of children.

Engagement with VA has a positive effect on the development of cognitive abilities such as the promotion of critical and reflective thinking (Posner et al. 2008; Shanahan et al. 2010), aesthetic problems-solving skills (Murphy 2003), and creativity (Flood and Bamford 2007; Lu 2013). Language communication, reading comprehension (DeMoss and Morris 2002), and writing skills (Marshall and Vashe 2008; Sacks and Ayers 2003) also are enriched. Positive influences have been noted in the social domain, for example, on group work, on peer collaboration and com-

munication of ideas, and on social interactions between schools that run art programs (Hutzel 2007; Loveless 2006). Overall, the role of VA in children's learning is now more vital than ever as it can provide them with necessary skills such as critical thinking, observing, and interpreting visual information to better function as informed citizens in this technologically advanced era.

13.3 The Present Study

This study aimed to support the students' learning process and enrich the learning environment by integrating technology (a multimedia interactive software) into VA teaching. Technology was incorporated in designing and implementing digital visual activities to promote students' engagement in active and argumentative critical viewing and interpreting of artworks. It was hypothesized that learners' cognitive skills would be developed and that students would enjoy these experiences through processes of contemplative dialogue and creation of artworks. This study was not restricted to using the computer only as a teaching aid for supporting VA, for example, as a digital art base or a "virtual gallery" (Ngan et al. 2003; Trautwein and Werner 2001). Nor was technology used as a separate cognitive subject focusing on learning a processing application to produce digital art forms (Black and Browning 2011; Mayo 2007; Thatcher 2004). The main focus was on integrating technology to support the learning process of VA and to advance students' skills in visual literacy (critical art viewing, creative expressions).

13.4 Method

13.4.1 Research Questions

This chapter reports on a part of a larger study that addressed the following research questions:

1. Can the use of educational art software support the process of critical art viewing (aesthetic value and perception)?
2. Can the use of educational art software support the process of art expression?
3. Can the use of educational art software promote students' social skills?

To answer the above questions, an educational art software was designed and implemented during a three-month period. Observations of the students' interactions were completed during the intervention and analyzed both qualitatively and quantitatively. A "Visual Culture Test" with questions around students' performance (aesthetic value and perception, aesthetic expression) was used before and after the intervention. The test was analyzed quantitatively to identify possible correlations

between the use of the specific software (technology) and the enhancement of aesthetic value, perception, and expression in VA.

13.4.2 Design and Participants

The setting was a public primary school in Piraeus, close to Athens (a middle-class socioeconomic area), with a class of sixth year students, 21 students in total (7 girls and 14 boys) aged 12 years. The class teacher was a university graduate, aged 33, and a permanent employee with 5-year teaching experience. Apart from the intervention, the teacher participated also as a "co-researcher" and was involved in the process of checking the coding and interpretation of data. Consent forms from parents and the Principal of the school were obtained prior to the start of the study.

The study involved an intervention phase, where the teacher of the class, under the researcher's guidance, learned to use software in order to improve the learning process and his teaching techniques in visual arts. Through interactive activities and a process of thinking routines, students with the help of the teacher critically viewed paintings of the twentieth century. Students were encouraged to design and create their own artworks.

13.4.3 The Educational Art Software

The software was created with "Flash CS4 Professional" (2008). The title of the software was "Picasso searching for his favorite brush in his studio." The user's task was to help the painter find his favorite brush by gaining clues in activities concerning the most important steps of the painter's life and work until the first decades of the twentieth century. Using this approach, the user was encouraged to explore known and unknown painting periods, events, and artworks of this time (four sections: Blue and Rose Periods, Black Period, and Cubism). Along with references to Picasso, certain movements were presented (Impressionism, Fauvism, Expressionism, Modern Art) through the works of great painters who lived and worked before, during, and after Picasso, depicting the way Picasso was influenced by others and vice versa.

Apart from the four main sections of content, the software had utilities such as biography of Picasso, dictionary, timeline, activities for introducing the basic elements (color, line, and shape), and an introductory video of History of Arts from 15.000 BCE up to the middle of the twentieth century. Due to its nonlinear programming, the software gave opportunities to the user, teacher, and student to navigate it in their own ways.

In the digital environment, the activities of the critical viewing and interpreting of an artwork were mostly interactive and had different difficulty levels, starting from basic cognitive skills such as careful observation of artworks and then moving

Fig. 13.1 An example of an "easy" activity. Each group had to try to find a suitable title for each painting from Picasso's blue period. A hint was available by dragging the mouse over the artwork (Copyright note at the end of the chapter)

to the description and identification of key morphological elements of the work (e.g., the dominant color, the basic figure, the subject matter, and so on – see Fig. 13.1).

At the most difficult levels, activities required the participation of higher cognitive functions, such as the comparison and discovery of common and non-common characteristics among works of the same or different painters and generalizations and inferences about the common characteristics of artworks belonging to a particular movement or art period or other characteristics (see Fig. 13.2). Verbal or written activities of critical or creative thinking about the observed artwork, digital painting activities, and creating artworks with traditional means and materials, which complemented the viewing activities, are further explained in "The Intervention" section.

13.4.4 The Intervention

The intervention occurred over a three-month period (March–June 2009). It involved a three-hour, continuous session held every week. The session included interactive activities with the computer software, for students to become informed about paintings of the twentieth century. Teaching was framed within a socio-constructive

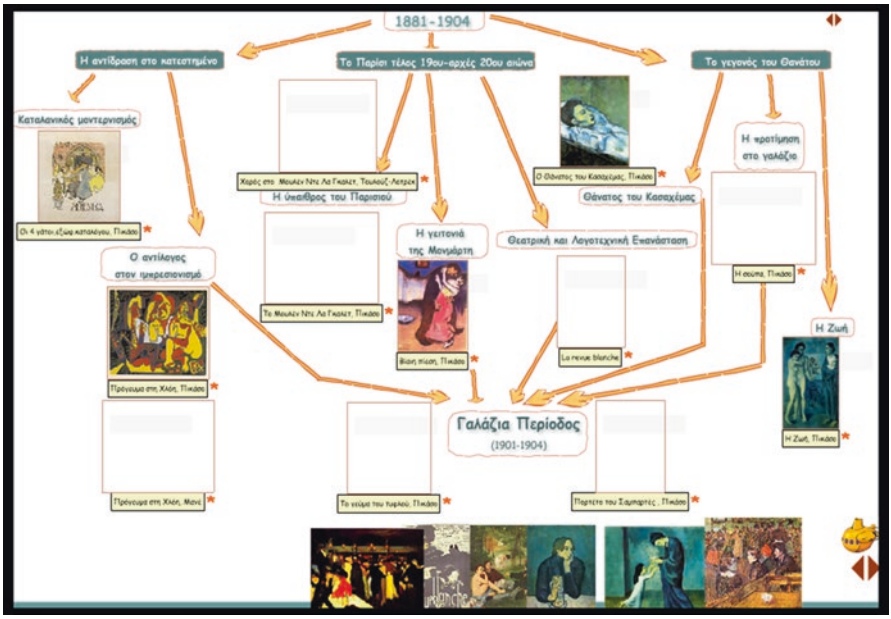

Fig. 13.2 An example of a "difficult" activity. Each group had to complete a mind map with paintings depicting Picasso's life and work from 1881 to 1904. Artworks were available at the bottom of the screen, and the user had to drag and drop the picture that matches each concept of the map (Copyright note at the end of the chapter)

learning context (Vygotsky 1978), supported by the digital environment of the specific application. Group work (five groups of four to five students) was adopted as the ideal framework for the promotion of social skills, cooperation, and positive learning climate (Burnaford et al. 2001; Matsagouras 2004). Additionally, teaching during the intervention was learner centered, providing scaffolding when needed. The teacher had a "mentor" role assisting students to construct their own knowledge. Students were encouraged to acknowledge the value of their own artworks, enhancing their self-esteem (Epstein and Trimis 2005; Ritchhart et al. 2011).

Worksheets accompanied the activities, and contemplative dialogues were included based on the model of "Artful/Visible Thinking" (by Project Zero of Harvard University). This approach encouraged children to express judgments, assumptions, or conclusions after critical viewing of artworks (Freedman et al. 2005; Sacks and Ayers 2003). Students were encouraged to write about the artworks they observed (e.g., narratives about the artwork's topic, short dialogues between the people who were portrayed in the artworks, poems around the topic of the painting).

Activities included digital painting activities (e.g., students repainting Picasso's artworks using color schemes like complementary, analogous, triadic on the computer) and activities with traditional painting materials, such as brushes and crayons (e.g., impressionistic painting, use of warm and cool colors). Traditional activities also involved children working on collages, mask making, and presentations of their artworks. These activities provided children with opportunities to use their experi-

ences, knowledge, and techniques. In this way, they were fulfilling both the role of the critical art viewer and that of the artwork creator (Freedman 2003; Marshall and Vashe 2008).

13.4.5 Measures

Videotaped observations took place during the intervention. Two groups were observed for four periods of time, during their engagement with each of the four main sections of the software, reaching a total of 348 minutes of observational data. Observations took place while groups were engaged with different artistic activities: critical viewing of a painting, critical interpretation of the painting, a piece of writing about the painting, digital artwork, and creation of an artwork with painting materials such as crayons and others.

To explore possible correlations between the use of the art software in the teaching of visual arts, a specially designed *Visual Culture Test* was created by the researcher and administered to the students pre- and post-intervention. The test was designed based on widely used visual art tests, including the Torrance Tests of Creative Thinking (Figural Form A and Verbal Form A, TTCT Torrance 1974) and the use of artworks as stimuli (Berlyne 1971; Limbert and Polzella 1998; Salmon 2001) in aesthetic measurements. With this test the performance of students was rated before and after the intervention in the areas of visual arts (aesthetic value, perception, and expression). The test consisted of 12 questions on aesthetic perception and 5 on aesthetic value and expression (Table 13.1: aesthetic perception questions, APQ0-APQ12; aesthetic value/expression, AVEQ1–AVEQ5). For example, some of the aesthetic perception questions were about classifications and comparisons of artworks based on their formal elements. In the aesthetic value and expression questions, students were asked to write a short story based on aesthetic criteria or special characteristics of an artwork or make a drawing and write about it.

13.5 Analysis

13.5.1 Quantitative Approach

SPSS statistical analysis software was used to analyze data from the scores from the *Visual Culture Test* before and after the intervention to explore whether the use of the software supported the process of critical art viewing (first research question) and art expression (second research question). The performed analysis was mainly descriptive (frequencies), and group scores were compared (one sample *t*-tests) to identify differences. Moreover, observations were analyzed quantitatively (descriptive analysis). Interactions among members of each group were categorized as

Table 13.1 Means, standard deviations, range, and one sample t-tests (*t*) for Visual Culture Test of students before and after the intervention

Before the intervention						After the intervention						
				Range				Range		Differences *t*-test		
Type of questions	*N*	*M*	*SD*	Min	Max	*M*	*SD*	Min	Max	*M*	*t**	*Df*
Aesthetic perception (APQ0-APQ12)	21	22,95	6,30	9	34	32,67	5,32	23	41	9,72	7,69*	20
Aesthetic value and expression (AVEQ1–AVEQ5)	21	12,95	2,89	7	17	13,95	1,77	11	17	1,00	2,53	20
Total visual culture (TVC: APQ 0–12 + AVEQ 0–5)	21	35,90	7,56	19	48	46,62	5,68	37	58	10,72	7,81*	20

*$p < ,05$

Table 13.2 Frequencies of the observed interactions on the computer, per category and quality, during the intervention

Interactions per category and quality	Group A								Group B							
	First observation		Second observation		Third observation		Fourth observation		First observation		Second observation		Third observation		Fourth observation	
Interactions with artwork/ computer	P	N	P	N	P	N	P	N	P	N	P	N	P	N	P	N
	P2: 63	B7: 13	P2: 62	N7: 8	P2: 95	N7: 9	P2: 89	N7: 7	P2: 59	N7:11	P2: 31	N7: 6	P2: 71	N7: 7	P2: 84	N7: 8
	P3: 39	B6: 2	P3: 19	N6: 1	P3: 32	N6: 1	P3: 36	N6: 0	P3: 13	N6: 1	P3:12	N6: 0	P3: 15	N6: 1	P3: 51	N6: 0
Subtotal	102	15	81	9	127	10	125	7	72	12	43	6	86	8	135	8
Interactions with the group	P1: 31	N8: 10	P1: 25	N8: 8	P1: 53	N8: 8	P1: 15	N8: 3	P1: 24	N8: 10	P1: 12	N8: 5	P1: 33	N8: 7	P1: 13	N8: 2
	P4: 11	N5: 8	P4: 11	N5: 4	P4: 12	N5: 2	P4: 8	N5: 0	P4: 7	N5: 4	P4: 6	N5: 2	P4: 10	N5: 1	P4: 3	N5: 0
Subtotal	42	18	36	12	65	10	23	3	31	14	18	7	43	8	16	2
Total	**144**	**33**	**117**	**21**	**192**	**20**	**148**	**10**	**103**	**26**	**31**	**13**	**129**	**16**	**151**	**10**
Percentages of the total number of interactions in the first and last observation	**81.31%**	**18.7%**					**93.6%**	**6.4%**	**79.8%**	**21.1%**					**93.7%**	**6.3%**

Note: Subcategorization in positive (P) and negative (N) forms of interaction based on Bales' system categories of interaction (Bales et al. 1979)
P1–P4: Positive interaction (is friendly and gentle with others, seeks interaction, agrees with the other team members, directs the discussion, offers opinion, supports and rewards others, positive emotional state)
N5–N8: Negative interaction (behaves badly to others, making negative comments, disagrees with others, stops interaction, works alone, orders, refuses to share, negative emotional state)

"positive" or "negative," during the four periods of observation, and frequencies were explored (Table 13.2). This kind of analysis was combined with qualitative analysis to provide a rich description of the use of technology in promoting social skills (research question 3).

13.5.2 Qualitative Approach

To assess social skills, video-recorded observations were subjected to content analysis in accordance with the methodological approach of "Grounded Theory" (Corbin and Strauss 1990). The sequence of interaction used as the analysis unit in the video-recorded observations and interviews included significant portions of the dialogue as a whole (Mehan 1979). The thematic and semantic analysis involved searching for sets of key words, as well as suggestions concerning viewing, interpretation, artwork creation, and interaction with the software or the computer. Additionally, the students' interactive behaviors with each other were subjected to thematic and semantic analysis. Subsequently, the data were encoded into the following constructive (thematic) interaction categories:

(a) Interaction with the artwork (viewing of artwork/artwork creation)
(b) Interaction with the computer and software
(c) Interaction with others/collaboration

Specific observational categories included subcategories of related interactions with the one not excluding the other. The total of the recorded frequencies in each interaction category, per group and observation, was encoded in "positive" (P) and "negative" (N) forms of behavior, based on Bales' scale (Bales et al. 1979). Bales' "Interaction Process Analysis" scale describes interactions among others as, for example, being friendly with the rest of the group, agreeing with others, contributing to a friendly climate, offering help and their opinion to the group, behaving badly or aggressively toward others, disagreeing, and continuously asking questions and guidance (Bales et al. 1979).

To assess aesthetic expression, students were asked to write down on worksheets short answers or texts (story/dialogue/poem), based on aesthetic criteria or special characteristics of the observed artworks. Those texts were subjected to content analysis (see above) with recording unit the word and analysis unit ten lines of text per page. The frequency of words relevant to the subcategory "Viewing the Artwork" (elements of the artwork, aesthetic criteria, History of Arts' references, specialized vocabulary) was calculated and recorded. Creative texts were also assessed in four domains: the fluency and flexibility of ideas, their originality, and their quality. A three-point rating scale was utilized: 0, no response; 1, a random list of details or report of what is in the picture; 2, a simple problem or situation is defined; and 3, a structured, complex situation or problem with a clear beginning, middle, and ending developed (Macgregor 2002).

13.6 Results

Students' aesthetic perception, aesthetic value, and expression were assessed quantitatively by comparing the scores of the Visual Culture Test before and after the intervention. Additionally, students' aesthetic expression was qualitatively assessed through an examination of their written texts (such as stories, comparative reports, dialogues, poems, titles).

13.6.1 Aesthetic Perception

There was improvement of students' aesthetic understanding and skills regarding the active and careful artwork viewing. Skills such as thorough observation of artwork, recognition of basic morphological data, identification of similarities or differences between artworks, and specialized visual vocabulary were improved by 44% after the intervention (see Table 13.1, first line: Cognitive skills), which was statistically significant.

13.6.2 Aesthetic Value and Expression

Students were able to understand and take into account aesthetic value, such as the creative imagination of the artist or the original expression of the artist's actual or internal world. However, the scores of the posttest for these five questions, though improved, did not reach statistical significance. This finding suggests that students' opinions about the "beauty" of an artistic creation did not change significantly (see Table 13.1: line 2; improving performance 0.77%) after the intervention, even though the information that the students learned about the painting was enriched (see aesthetic perception). For the participants of this study, the aesthetic pleasure from the experience of critical viewing of artworks was drawn mainly by concrete concepts, such as understanding the content and interpretation of forms, and the symbolic use of colors or shapes that conveyed the painter's messages. Paintings that did not encompass these concrete characteristics remained less favorable among students, even after the intervention.

The qualitative analysis of the students' content of the writing texts, as a basis for reflective dialogue during the viewing process, showed important changes in student thinking. The level of students' visual expression shifted from a mere description of the morphological artwork elements (such as the dominant color, the kind of shapes, the number of the forms) to the operational understanding and usage of aesthetic concepts (aesthetic criteria, History of Arts' references, specialized vocabulary). Students composed creative pieces of writing transforming their aesthetic experiences (knowledge and feelings) to written word using their imagination, orig-

inality, and freedom of thought. Visual literacy (perception, values, and expression) prevailed in their writings.

Overall, the improvement in total scores of the Visual Culture Test in post-intervention was statistically significant (see Table 13.1, third line). Qualitative analysis of students' creative writing texts supplements this significant improvement and provides a more positive picture, as further explained in the Discussion.

13.6.3 Social Skills

Observations of students engaging with the digital and traditional activities were analyzed quantitatively and qualitatively. Results revealed that during the intervention, students' behaviors changed as they adopted a teamwork collaborative spirit working to achieve common goals.

Students identified the value of their interactions with the software, as it contributed to more effective cooperation and to the development of critical thinking through discussion and peer teaching. The cooperative behaviors and the active involvement of all members of the group in the software activities underlined the advantages of teamwork. These positive transformations are shown in Table 13.2, where students' interactions, following Bales' scale, are presented and compared. At the end of the intervention (see Table 13.2, fourth observation), both focus groups (A and B) developed positive interpersonal interactions. Children improved their social skills by adopting a collaborative learning culture, setting common goals, and cooperating.

Furthermore, the qualitative analysis of observations and group interviews provides more evidence of how the groups actively participated in an interactive process through the collaborative activities of the software. The following videotaped observation segment of Group A (the small letter defines the sex, boy or girl, the capital letter defines the group, and the following number represents each member/student of the group) referred to a digital painting activity where the team members were asked to repaint a Picasso's blue period painting using a complementary scheme of colors. The group had already decided to use the complementary blue and orange colors. The interactions among the students showed structures of mutual help that they had developed in order to accomplish their task, support and encouragement especially for the "weak" members, and opportunities to equal participation of all members (the original extract is in Greek – see Appendix A):

bA2*: I think that each of us should make his own choice, you don't have to do it alone, it is easy for all (he means each member to take the mouse and change the colour shades, not for him to be the one to move the mouse and execute the choices).*

gA1*: (She seems annoyed by what was proposed but gives the mouse to a classmate and asks him): N., Can you do it, by yourself ? You want it?*

bA4*: Where do I click? Here? (asks for help from the group)*

gA1: *(Points to the screen and explains the graphic and what the color slider does to orange and blue complementary scheme they have chosen): First, you have to choose the part you'll colour, and then pick the colour.*

bA4: *Which one is the 29 piece; Is this part on the Vase? I think it is this one on the vase, yes on the vase, it wasn't there before…I'll do it orange…*

gA1: *Do you want to do it orange? Nice, lighter or darker to the screen's model? (waits)…No you have to drag the mouse left…dark colours are at the left side (points to the screen). You see? Do you like this colour? Yes? Ok, it is nice… well-done!*

Both quantitative and qualitative results show that, after the intervention, students developed "positive" interpersonal interactions, such as the cocreating of digital works, promotion of peer support, and equal participation of members in discussing and sharing of ideas.

13.7 Discussion

The starting point of this research project was that there were few studies that investigated how digital technologies support the teaching and learning of visual arts, especially in primary school. In line with previous studies (Gregory 2009; Roland 2010; Stavridi 2015; Tillander 2011), results revealed that the use of interactive digital technologies had a positive influence on students' aesthetic perception, value, and expression.

Findings revealed that students' aesthetic perception skills were advanced significantly after the intervention. With the help of an interactive and pleasant environment, students observed artworks, engaged in thoughtful dialogue activities, and became capable of approaching, understanding, and interpreting great works of art through divergent thinking, problem-solving, and multimodal process (Li and Jiang 2015; Unrath and Mudd 2011).

Furthermore, students' aesthetic expression was facilitated and enriched by the use of technology. The friendly environment of the software gave students the opportunity to express fearlessly themselves (Wood 2004) when making their digital artworks (Murphy 2003) and also be creative and innovative with their own written or tangible aesthetic products (Ashford 2002; Macgregor 2002). Students exercised their synthetic abilities, combining information and imagery from a multitude of sources and transforming their artworks into something new and meaningful (an innovative story or a poem, a painting, etc.) (Eisner 2004).

The students' aesthetic value skills were least influenced by the digital environment and the instructional strategy. There was a small improvement, although not statistically significant, for this set of skills. Though no specific study was located by the researchers in this field and for this age group to help with a deeper understanding of this finding, the theory in the area of visual arts informed us that primary students mainly concentrated and understood the concrete depiction of reality

(Parsons 1987). As "naive" art consumers (Trautwein and Werner 2001, p. 256), they did not seem ready enough to change attitudes and perceptions about "beauty" of artistic creation relevant to their aesthetic development. The aesthetic pleasure from the experience of active and critical viewing of artworks was drawn mainly by being able to understand the content and the interpretation of forms as well as the impact of the favorite colors or shapes. In our study, the students' interest for the artworks and their ratings of the beauty of the paintings remained unaffected by the supportive multimedia application and the different viewing conditions, and this finding was consistent with previous studies with college students (Martindale et al. 1990; Trautwein and Werner 2001). More research in this specific area of visual arts with young children is necessary to shed more light into the reasons behind certain limitations and whether new technologies could (or not) assist in this field.

Finally, students' social skills were supported. During students' creative endeavors, positive interactions increased, and negative interactions decreased by the end of the intervention. The qualitative findings from the analysis of observations, consistent with previous investigations (Hutzel 2007; Loveless 2006), also concur that the use of digital technologies in teaching visual arts can offer students a rich cooperative learning environment. Through interactive viewing activities, problem-solving dialogues, as well as cocreation of artworks, teamwork and collaboration were promoted.

13.8 Conclusion

Despite the short duration of the teaching intervention and the small sample, this study further supports the use of technology in teaching visual arts effectively. This study makes a significant contribution to knowledge as has successfully integrated technology in the teaching of visual arts and has filled a gap in understanding the ways that digital technologies could advance visual literacy skills for young students. While new technologies do not, of course, replace traditional art processes, they do extend the possibilities of significant changes in aesthetic perception, art expression, and social skills within a constructive context (Phelps and Maddison 2008). Overall, findings from this study suggest that a constructive use of technology, more complex than just visiting a museum or an art gallery, can significantly contribute to the promotion of students' visual culture transforming them to critical viewers of art and imaginative creators.

Appendix A: Student's Transcript from the Observation in Greek

αA2: *Εγώ νομίζω ότι ο καθένας θα πρέπει να κάνει μόνος του την επιλογή του, δεν είναι ανάγκη να το κάνεις μόνη σου, είναι εύκολο για όλους (εννοεί να πάρει το ποντίκι και να επιλέγει ο καθένας μόνος τις τονικότητες του χρώματος, χωρίς εκείνη να εκτελεί τις επιλογές του καθενός)*

κA1: *(δείχνει ενοχλημένη από την πρόταση, αλλά δίνει το ποντίκι σε συμμαθητή της στην ομάδα). Ν…., θέλεις να το κάνεις μόνο σου; Μπορείς;*

αA4: *Πού πατάω; Εδώ; (ζητά διευκρινίσεις από την ομάδα)*

κA1: *(του εξηγεί δείχνοντας την οθόνη με το γραφικό σχέδιο και το μεταβολέα των δύο χρωμάτων, μπλε και πορτοκαλί που έχουν επιλέξει ως συνδυασμό για το συμπληρωματικό σχήμα) Πρώτα διάλεξε το κομμάτι που θα χρωματίσεις, και μετά το χρώμα.*

αA4: *Το 29, ποιο είναι; αυτό το κομμάτι, στο βάζο… αυτό έβαψε; Ναι, στο βάζο, δεν ήταν πριν… Θα το κάνω μάλλον πορτοκαλί…*

κA1: *Πορτοκαλί, θέλεις; Ωραία, ανοικτό ή πιο σκούρο από αυτό στην οθόνη; Όχι, αριστερά, πρέπει να το τραβήξεις, τα πιο σκούρα είναι από εκεί… (του δείχνει στην οθόνη). Βλέπεις; Σου αρέσει αυτό το χρώμα; Ναι; Ωραίο είναι! Μπράβο!*

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