

The Reflections of Visual Literacy Training in Pre-Service Teachers' Perceptions and Instructional Materials Design

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Abstract

This study was conducted to describe the visual literacy training perceptions of pre-service pre-school teachers and the way they use the design tools learned during visual literacy training in their instructional materials. Participants were 57 pre-service teachers and 226 pre-school students. Qualitative data were collected by using semi-structured interviews and student diaries, while quantitative data were collected through the use of graded materials evaluation forms and observation forms for pre-school students. The findings suggested that pre-service teachers had positive perceptions of the visual literacy course. In instructional materials design, they were often successful at the use of design tools.

Keywords: visual literacy training, visual design tools, instructional technology and materials design course

1. Introduction

“Instruction” is a function performed by teachers, materials, and other mediators, while “learning” is done by students. Instruction is intended to provide the conditions for learning (Fleming & Levie 1978). It is important for teachers to manipulate environmental variables so they can bring about the desired changes in their students (Engelmann, 1969). Among these variables are the teacher's use, selection and design of instructional materials. Learning experiences are formed by instructional messages. Instructional message design is related to many literacies led by language literacy and print literacy. Visual literacy is a necessary skill for instructional message or material design. This study examines how preschool education teacher candidates perceive visual literacy training and how this training is reflected in the instructional materials they design.

1.1. Visual Literacy

The literature holds various other definitions of visual literacy than the one made by the IVLA (International Visual Literacy Association) (Brumberger, 2011; Felten, 2008; Bleed, 2005; Metros & Woolsey, 2006; Avgerinou, 2009; Seels, 1994; Sosa, 2009; Pettersson, 2009; Chauvin, 2003; Velders, 2000; Heinich et al. 1989). These definitions show that visual literacy is perceived as a group of competencies, a teaching method, teaching processes, a move and an interdisciplinary field. Visual literacy guides a set of seeing or viewing competencies, which is developed by seeing and being simultaneously intertwined with other sensory experiences. A person with advanced visual literacy can perceive and analyze the actions, objects and symbols around him/her, whether natural or artificial. Regarding its creative use, the visual literacy competency reveals itself by interacting with other competencies possessed by people. What makes the use of this competency create admiration is the ability of individuals to perceive and enjoy mastery of visual communication (Debes 1970; Braden, 1996; IVLA, 2012). Visual literacy contributes to the communication of humans with themselves and the world. Therefore, visual thinking, learning and communication help define the phrase (Seels, 1994). However, efforts need to continue to provide a consensus on the definition of visual literacy (Brill & Dohun 2007). Depending on individuals' background, there may be different definitions of visual literacy (Baca & Braden, 1990; Bleed, 2005).

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In line with the identities of artist, educator and researcher, this study emphasizes the visual message interpretation and production competencies of visual literacy, and its aspects related to instructional methods and processes. Jonassen and Fork (1975) stated that the root of visual literacy is eclectic. Levie (1978) writes that this definition should be made to emphasize symbolic modality rather than sensory. Bieman (1984) feels that this definition should include information on what visual literacy is as well as what a visually literate person can do, and make use of other literacy evolutions. According to Rezabek (1999), visual literacy should include the interpretation and creation of the message transmitted by the sense of seeing, but emphasize the communication established independently of this text. Robinson (1984) argues that to interpret visual messages, one needs to know its elements and the process. Visual literacy is the ability to evaluate and understand the contents of an image as well as its aesthetic composition and structure. Brill & Dohun (2007) and Avgerinou (2007) write that an operational definition of visual literacy may be possible with education studies based on measuring the group of visual competencies put forward by the IVLA.

1.2. Visual Literacy Training

Most people are known to be visual learners (Felder & Soloman, 2001; Pettersson 1993) and the design of images is at least as important as their execution, context and format. In the first stage of information processing, images help expand the borders of short-term memory (Hodes, 1998). According to Paivio who developed the dual coding theory, pictures are strong because they are recalled more frequently than verbal information. This is known as "pictorial superiority effect". When words are transformed into images, images are automatically transformed into words (Miller & Burton, 1994, 73). According to the dual coding theory, the learner uses two different information-processing systems. The first system is the visual representation of knowledge, and the other one the verbal representation of it. The dual coding theory contends that when visual and verbal information is given together as opposed to separately, these connections are formed more easily (Mayer & Sims, 1994, 390). Visual messages are fundamental to complex mental processing as they provide opportunities and input for analysis, which cannot be provided by mere text (Brill & Kim 2007). Studies has suggested that enhanced learning and retention is promoted when visual material is used in teaching (Dwyer & Baker, 2001; Carney & Levin, 2002; Dwyer & Dwyer, 1985; Anglin, Vaez, & Cunningham, 2004; Mayer, 2005; Rieber, 1994; Clark & Lyons, 2004; Standing, Conezio, & Haber, 1970; Levin, 1981; Lohr, 2008).

Visual literacy is a language. It needs to be learned in order to be able to use it for communication (Stokes 2002; Sinatra 1986; Messaris 1994; Dondis 1973; Burmark 2002; Avgerinou & Ericson 1997). In recent years, educational discourse has started to mention the importance of visual literacy (Avgerinou, 2009; Yeh & Cheng, 2010; Riesland, 2005; Bleed, 2005; Elkins, 2008). Brumberger (2011) writes that university students who are exposed to visual images and considered digital natives actually have low levels of visual literacy. Similarly, Rourke & O'Connor (2009) found that the visual literacy levels of design students were rather low. Just as a person who continuously listens to music on his/her iPod cannot automatically be expected to teach others to make music or critically analyze it, people who live in an image-rich world do not automatically possess sophisticated visual literacy skills. Visual literacy may be learned with methods similar to those used to learn text literacy. In order to produce, analyze and use images, new and more sophisticated methods of learning should be used (Felten, 2008, 60). Ariga and Watanabe (2008) developed an instructional material (Image-Plot and the Standard design table) to enrich visual expression in graphic and website design by students who had not had any previous graphic design or art education. The majority of students were undecided about the benefits of the material, while some of the remaining ones reported negative views and other reported positive ones. Among the teachers, some stated that the material had been beneficial while others stated otherwise. The study concluded that such materials may be beneficial in enriching visual expression, but visual literacy training is essential. Favorable results have been obtained in studies focusing on visual literacy training for students and candidate teachers (White 2012; Yeh & Cheng, 2010; Mbelani, 2008; Whitener-Lepanto and Harroff, 2002; Feinstein, 1994). Studies on these topics will contribute to the development of visual literacy training.

1.3. Visual Literacy Training and Instructional Materials Design

Instructional materials design requires reading and writing visual messages, or visual literacy skills. Previous studies show that even scientists have difficulty interpreting the graphics in certain instructional materials. Students and teacher candidates do not even attempt to read certain visual elements, which eliminates the educational worth of the visual elements and messages in the materials (Roth, Bowen and McGinn, 1999). From pre-school to higher education, traditional instruction focuses on verbal forms of communication, which are reading and writing. It only rarely deals with the quality and forms of visual messages (Yeh & Lohr, 2010).

Writing about the importance of visual literacy in the 70s, Cochran (undated) emphasized that visual communication skills must be as fluent as verbal communication skills. One of the aims of visual literacy training for teachers is to improve their visual language skills and teach how to juxtapose visuals. Pre-service teachers need technology training that covers visual design, which may only be possible through visual literacy training (Yeh & Cheng, 2010; Yeh & Lohr, 2010; Sosa, 2009; Pettersson, 1993; Brumberger, 2011). With visual literacy training, they learn about the tools, principles and elements of visual design and improve themselves in these issues. The visuals and words used in instructional materials should be designed to help selection, organization and integration in the process of knowledge construction (Mayer, 2001). To do so, it is crucial that the principles and elements of design are used. Regardless of the content, visual learning materials will increase information retrieval and processing. It is particularly important to plan the visuals in instructional materials owing to the new multimedia systems that allow high quality visual information (Hodes, 1998). Good, clear visual information help the reader grasp concepts more quickly (Brady, 1993). Visuals used in instructional materials are used only to support information and not to make the paper "pretty." (Rotter 2006; Barnard, 2002). The page is not too "busy," and pictures are not distracting. Students will easily recognize the visuals. They are recognizable to the pupils, not dated (e.g. rotary phones). They are culturally sensitive (Rotter 2006). An effective visual design may attract the student's interest and enhance his visual culture and enjoyment level (Giorgis, Johnson, Bonomo, Colbert, Conner, Kauffman & Kulesza 1999). In visual literacy, knowledge of visual vocabulary is of prime importance. This refers to knowledge of the main elements of visual language, such as dots, lines, style, form, space, texture, light, color, and motion (Avgerinou, 2009; Jefferies 2007; Rotter 2006). These need to be used accurately in visual design. They are, then, the tools of design. Previous authors have emphasized the esthetic and artistic features of material, as much as its functional features, when questioning the meaning of design (Pettersson, 2006). In Jin and Boling's (2010) study, students found visuals negative with respect to instructional functions. This may be attributed to the fact that visual materials are not exclusive and have poor design. Design tools play a major role in design processes or design activities. Dissatisfaction with the execution of a message may cause dissatisfaction with its content (Pettersson 1993).

1.4. Design Tools

The PAT model proposed by Lohr (2008) includes Perception, Actions and Tools. Perception explains the three principles that the human mind uses to recognize knowledge. These are figure/ground, hierarchical and gestalt. Actions comprise four elements: contrast, repetition, alignment and proximity. Tools, on the other hand, are considered to be the main elements of design. These are type, shape, color, depth, space and balance. In this study, the tools principle of the PAT model is used. *Type or typography* is the design of letters, words and sentences, and all other writing on the page. In this design, esthetic and visual representation is as important as legibility. Typography can alert learners to such things as main ideas, important concepts, rules, sections, subsections, and more (Pettersson, 1993). If a design adopts many different font faces and sizes, it may create confusion for the viewer. If type is to be designed together with visuals, it needs to become one with these visuals regarding both the message and esthetics. All principles and tools of visual design need to be used effectively because type may be seen as a shape. A *shape* is formed by bringing together the two ends of a line. Styles are two-dimensional to symbolize the structure of objects in a visual design. There are three main shapes: circle, equilateral triangle and square. The main shapes can be explained with their visual directions or associations. Circles remind people of curvy directions, triangles of diagonal directions, squares of vertical and horizontal directions. Irregular, hard-to-perceive shapes are more dominant than the main and regular ones because they attract more attention (Pettersson, 1993). Arntson (1998) stated "Design is the arrangement of shape. They underlie every drawing, painting or graphic design" (p.45). According to most designers, the first thing to consider before starting design is in which style to place the message, such as in a rectangle or square (Lohr, 2008). Style is probably the first thing to be perceived in visual messages and is the backbone of design. *Color* is a specific sensation that light creates in the human eye when it hits objects, excluding black and white. Color content may be examined in three elements: Hue, value and saturation. Hue is a specific wavelength that the human eye perceives as color, such as red, blue and green. The two qualities of hue must be considered when using color: Value ve saturation. Value is related to the lightness or darkness of color. A higher value color means brighter colors nearer to white, such as yellow. A lower value color means closer to black, such as navy blue. Another name for saturation is chroma; it is the purest state of color (Holtzschue, 2011; Lohr, 2008). The more a color is mixed with other colors, the less the saturation of that color.

Colors at a high saturation level create a brighter effect in the eye, while those at a lower saturation level create a subtler effect and appear to be in the background. When using color for instructional purposes, it is important to increase saturation, and decrease value and hue for large areas particularly (Lohr, 2008). Tufte (1990) mentions the four instructional functions of color: Labeling, identifying quantity and measurement, representing reality, and creating esthetic appeal (as cited in Lohr, 2008, 265). The labeling function of color helps us distinguish between different parts of a visual design. For instance, in a diagram displaying a human arm, red lines may represent arteries and blue lines veins. In the identifying quantity and measurement function, color is used to identify amount, for instance in a pie chart. The representing reality function refers to color adding reality to visual design and enabling a concrete description of an object. *Depth* refers to scale, dimension and texture in Lohr's book (2008). It plays an important role in information standing out. Scale is presenting the size perception of objects in such a way as to help the viewer understand new information. An example may be the presentation of a caterpillar together with a leaf in order to inform children about the size of certain animals. Dimension, on the other hand, gives depth to the visual or writing. When used properly, it facilitates the selection and perception of objects. When used more than enough, it leads to confusion. Texture adds reality and enriches the visual. For instance, a walnut is perceived more easily when drawn together with its texture. *Space and balance* are important to composition of design. Space occurs between visuals and text, and facilitates reading and perception. Compressing too much content onto one page leaves little white space for visual relief (Adler, 1991). Music is also made by the spaces between notes. Thus, it is essential to leave white space in a good design. Balance has two types: symmetrical and asymmetrical. Asymmetrical balance is better at drawing attention than symmetrical. Lack of balance in visual design makes the viewer uncomfortable (Pettersson 1993). Balance can be achieved by figure ground relationships, the ratio of spaces, and use of color. Media education has amassed studies that assess the contribution of media to teaching and learning (Tyner, 2005,178). Media education covers all new literacies including visual literacy. Even though studies aiming to advance students' and teachers' visual literacy are on the rise (Brumberger, 2011; Schonborn & Anderson, 2010; Wu & Newman, 2008; Carter, 2003; Sosa, 2009; Yeh & Lohr 2010; Yeh & Cheng 2010), there are studies which argue that not enough importance is attached to visual communication and literacy in teacher education programs (Britsch, 2010; Sadik, 2009). This study was conducted to describe how pre-service teachers perceive the visual literacy training they receive, and to what extent and how they reflect this training in their instructional materials regarding design tools. The research questions in this study were as follows: 1. What are the perceptions of pre-service teachers about visual literacy training? 2. What are the perceptions of pre-service teachers about the materials they design? 3. How do experts evaluate the use of design tools in pre-service teachers' materials? 4. What are the reactions of pre-school students to pre-service teachers' materials?

2. Methods

2.1. Participants

This study aimed to identify the reflections of the visual literacy training given to pre-service teachers in the instructional materials they designed. Participants were pre-service teachers (57), pre-school students (226), experts (2), observers (3). Pre-service teachers were attending Gazi University's Early Childhood Education Department and had taken the author's Instructional Technologies and Materials Design course. Of these, 7% were male and 93% were female. Thirty-three students (57%) were aged between 18-20 years, and others (43%) between 21-23 years. Pre-service teachers had not previously taken a course on visual literacy and visual design. Of the two experts in the fields of art education and instructional technologies, one is the author of this article. Both experts hold BA and MEd degrees in art education, and a PhD in instructional technologies. The observers were three pre-service pre-school teachers who had received training in observations. The remaining study group comprised 5-6 year-old pre-school students (226), 11 or 12 on average from each of the 19 elementary schools studied. All participants agreed to take part in the study.

2.2. Procedure

In a previous study, Yeh & Cheng (2010) used the actions of visual design principle of Lohr's PAT model (2008) for visual literacy development among pre-service teachers. In the present study, the tools of visual design principle of the model were used. Tools are considered to be the main elements of design. Most designers consider color, simple shape, space, depth and typography when designing visuals (Lohr, 2008). Within her instructional technologies and materials design course, the author offered four 60-minute sessions (240 mins in total over a course of four weeks) on visual literacy and visual design tools (type, shape, color, depth, space). The sessions involved an introduction to visual literacy and practice in making meaning of, interpreting and creating visuals.

The students were shown various visual messages with academic and non-academic content, and these were discussed and interpreted. Teachers used simple techniques to enhance their description, analysis and interpretation skills by extending looking and slowing down the seeing process. For instance, they discussed messages in the McDonalds logo, a TV commercial, and an artistic drawing. This helps build students' allusionary base (Phillips, 2005). Students were asked to draw the road plan of a part of their city on the board, and drawings with simple messages for pre-school students. In these sessions, 35 powerpoint slides on "The PAT Model for Visual Design-Tools" were used. In the remaining three weeks, pre-service teachers got together in groups of three and designed instructional materials to facilitate the concept learning of pre-school students. During materials design, they paid attention to the use of design tools. A total of 19 instructional materials were designed, 10 of which were interactive posters in the form of flip charts, and the remaining 9 interactive powerpoint slides. Materials were designed by making use of paper and pens, glue, paint, hardboard, cardboard and computer programs (Word, PowerPoint, Photoshop). The pre-service teachers first presented their instructional materials in their own class. Following this, they presented their instructional materials in the pre-school classes of the 19 elementary schools chosen for practice teaching. Each presentation took between 30-45 min.

2.3. Data Collection Methods

There are three commonly used approaches in combining research methods. The first approach is the primary collection of qualitative data supported by quantitative data; the second one is using quantitative data as the main input and supporting it with qualitative data; and the third one is collecting qualitative and quantitative data simultaneously (Gay, Airasion & Mills, 2006, 184). This study uses the first approach of qualitative-quantitative method combination. Qualitative data was used in the description of pre-service teacher perceptions of visual literacy training and of the materials they designed, as well as the pre-school student perceptions of these materials. These data were collected by semi-structured interviews and journals. Semi-structured interviews enabled an in-depth exploration of perceptions expressed by pre-service teachers in their own terms. This approach is mostly suggested for ethnographic studies, in which a strong emphasis is given to exploring the nature of social phenomena rather than testing hypotheses about them (Furlong & Edwards, 1993). Merriam (1988) indicated that it is important to collect data through interviews when the researchers are interested in past events and experiences that are impossible to replicate. At the end of the study, 19 group interviews were held with all pre-service teachers. There were three pre-service teachers in each group and each interview lasted 30 to 45 min. During the interviews, the researcher and the other interviewer took notes. In developing the interview forms, the first step was to examine the literature on visual literacy training, visual design tools and instructional materials design, as well as the course content. The draft questions and probes were submitted for expert review, and revised in accordance with the feedback obtained from them. Then, interviews were held with 3 pre-service teachers to test the intelligibility and sufficiency of the questions for data collection. Based on the feedback from these interviews, certain questions were amended and the interview form was finalized. The interview questions were as follows: (i) What impact has the visual literacy course made on you? (ii) What do you think about visual communication? (iii) What do visual design tools mean for you? (iv) In your opinion, what is the significance of visual literacy training in pre-school education? (v) How did visual literacy training contribute to the materials you prepared? (vi) What are the reactions of pre-school students towards your instructional materials?

Throughout the study, students were asked to keep four journals. Pre-service teachers wrote their first entries after the first class of visual literacy training, their second entries after the fourth class, their third entries after designing their instructional materials and presenting them in their class, and the fourth entries after presenting their instructional materials in the pre-school classes. A total of 228 entries were collected from the students. Quantitative methods were used to describe the expert evaluations of design tools use in the materials of pre-service teachers and the reactions of pre-school students to these materials. The effectiveness of pre-service teachers' materials was rated by experts from 1 (very poor) to 5 (very good) in terms of design tools. The materials evaluation form used by the experts included items taken from the PAT Model for Visual Design-Tools on shape, color, depth and space, but not type. The reason for the exclusion of type was that the pre-service teachers prepared their instructional materials for pre-school students who are not literate. Materials were designed mainly considering visual elements. In order to achieve inter-rater reliability, the same forms were used to pilot materials evaluation sessions.

After expert evaluation (38) of the design tools used in the instructional materials (19), consistency between raters was examined with the t-test, and consistency was found according to the F results of the analysis of 8 items respectively [1.(F=1.479), 2.(F=2.650), 3.(F=1.994), 4.(F=3.515), 5.(F=0.151), 6.(F=3.789), 7.(F=0.552), 8.(F=2.211)]. In order to observe the reactions of pre-school students to the instructional materials used, an 8-item observation form was prepared by the researcher. Initially having 12 items, the observation form was reduced to 8 items after expert feedback and pilot observation sessions. Out of the eight items, two related to the materials use of pre-service teachers and effective communication with students; and six related to student behaviors towards the materials. The two behaviors of pre-service teachers were included in the form in order to control the variable of teacher behavior, which may affect materials presentation and learning. The behaviors listed in the form were evaluated from 1 (not observed) to 5 (observed many times). The Cronbach Alpha reliability coefficient of the observation form was .68. The observers, who were pre-service pre-school teachers, had received training in observing classrooms and engaged in pilot observations at pre-schools. At the end of the pre-school observations (57), each item was subjected to ANOVA to identify inter-rater consistency [1.(F=0.201), 2.(F=0.270), 3.(F=0.494), 4.(F=0.024), 5.(F=0.288), 6.(F=0.984), 7.(F=0.683), 8.(F=2.049)].

2.4. Data Analysis

The interviews were transcribed verbatim. At the beginning of the analysis, data were examined line by line. This enabled the researcher to use the analytic procedure freely, moving backwards and forwards quickly. After the data were organized, the researcher coded the data into categories by using a reflection-coding scheme, based on Hatton & Smith's (1995) framework. The interviews were transcribed to identify and analyze recurrent patterns and themes. This was followed by analysis across cases. Descriptive data was also presented by giving quotations from the written artefacts. Interview notes with each student were analyzed separately and conducted a cross-case analysis. The same procedure was used in the analysis of the journals. Based on the responses, the data were organized as follows: the reactions of pre-service teachers to visual literacy training, the reactions of pre-service teachers to the materials they designed, and the reactions of pre-school students to the materials.

3. Results

3.1. Pre-service teacher perceptions of visual literacy training

Pre-service teacher perceptions of visual literacy training are given under the themes of visual awareness, the necessity of visual training, visual literacy experiments and design tools.

3.1.1. Visual Awareness

Most pre-service teachers stated that visual literacy training enhanced their visual awareness. The views of pre-service teachers on the difference between "looking and seeing" were as follows:

D.K. Looking and seeing...Which one is more important in my life? This was the questions I asked myself after taking the course. How much of the things I look at can I actually see? I started to look at the occurrences in the streets I walk every day with a new perspective. H.K.E. After this course, I've started to analyze visuals by pondering their message rather than whether they appeal to me or not.

As can be seen, pre-service teachers improved their visual awareness and sensitivity, which are among the objectives of visual literacy training.

3.1.2. The Necessity of Visual Training

The perceptions of pre-service teachers on the importance of visual communication in daily life and particularly in pre-school education were as follows: L.B. I used to get help from texts or people to reach information, now I've changed. I'll also look at visuals. I will make use of them to convey an idea to others and my students. I want to improve my visual literacy knowledge.

N.O. This course showed me that visual communication can be very effective and easy-to-use with children at pre-schools. Children are open to visual communication.

Some pre-service teachers also mentioned the positive effects of visual communication on personality development. B.Ç. In my opinion, this course taught us a lot and it will continue to do so. It is essential for our personality development, to understand others better and to express ourselves better. As can be seen, pre-service teachers believed in the significance and necessity of visual communication.

3.1.3. Visual literacy experiments

In order to improve pre-service teachers' skills in making meaning of and interpreting visuals, some common and uncommon visuals were shown to them for class discussion and interpretation. The following quotations reveal that the pre-service teachers found this practice both fun and effective: S.T. In the drawing that was shown in the visual perception class, which included an old and a young woman, I first saw the old one. Despite trying very hard, I wasn't able to see the young woman for a while. When I finally did, I was very happy. It was a startling experience. M.A. Picasso's Guernica impressed me a lot. The class discussion on the painting was informative. After listening to the story of the painting, I particularly thought that the visual description in it was a feast.

Z.Y. Examining the visual symbols on the board or in the slides, discussing their meaning and trying to guess it made classes more fun. The abstract symbol of water and pipe drawn for the international plumbing fair particularly made those who guessed it right happy, and forced those who did not to think. Volunteering pre-service teachers in the classroom were given practice in creating messages with visuals; in other words, they were given practice in visual authorship skill development through activities such as drawing maps.

G.A. During class, I drew on the board a plan that shows the way from the dormitory to the building. I showed the entire class how bad I am at giving directions and drawing. I realized that telling by drawing is at least as important as telling by writing...

3.1.4. Design Tools

In the visual literacy course, the design tools of color (figure-ground), integration, (using color to connect parts to whole, and to match mood), simple shapes, space and balance, depth (scale, dimension, texture) were exemplified. Pre-service teachers stated that they felt as if they had been told this information for the first time and felt impressed by what they learned. The quotations below support these ideas:

A.K. I never thought until seeing the examples in this course that simple drawings could be made with only a few dots and lines.

B.V. I learned in this course that yellow is the most striking color due to its short wavelength and that is why taxis are yellow. Whenever I wear yellow from today onwards, I will feel as striking as a taxi! I noted the following statement about the role of space in visual design: "The space between the notes makes the music."

Y.A. I used to think that symmetrical balance is more interesting in design. However, it turns out that asymmetrical balance is more attention catching.

Answer to the first key research question: Teacher candidates stated that visual literacy training (1) increased their visual awareness, (2) they understood the necessity and importance of visual communication, (3) they learned about design tools, (4) they were encouraged to develop visual interpretation and visual message making skills by engaging in visual literacy experiments, and they enjoyed the process.

3.2. Pre-Service Teachers' Perceptions of the Materials they Designed

Pre-service teachers presented their materials in their classes. They presented their perceptions on their own designs and those of others by using the following themes: Process (care, intensive effort and liking), effects of visual literacy training and design tools on their materials design, and the match between materials and student level.

3.2.1. Process (Care, Intensive Effort and Liking)

Pre-service teachers stated that during the preparation stage they got rather tired, made a lot of effort and liked the instructional materials they created.

R.A. I honestly did not expect such effective and impressive materials from my class. I listened to the preparation stage of my friends and realized how much effort everyone made.

G.G. When we designed the posters on professions and numbers, we tried to keep to the schedule by adding something new every day. We tried to find pictures from the Internet but didn't like what we found. The children couldn't clearly perceive the pictures. They needed to touch the posters and interact with. We thus decided to draw the majority of the images ourselves, which was fun.

We shared them with our friends, and asked them to guess the message without giving any explanations. At all stages, we paid attention to visual design tools. Simplicity, balance, use of space, color selection, and unity was crucial to us. We were very happy to receive positive feedback from our friends in class (Fig. 1 and 2).



Fig. 1: Interactive Poster



Fig. 2: More of Interactive Poster

3.2.2. The Effects of Visual Literacy Training and Design Tools on Materials Design

Pre-service teachers wrote in their journals that, thanks to visual literacy training, they took care to use design tools in their materials and were able to criticize those of others.

R.A. I felt honored that I had enough knowledge to criticize the materials presented in class. The instructional technologies and materials design course enriched with visual literacy training opened a whole new window onto life.

N.B.R. My friends and I prepared slides on seasons. When preparing them, we preferred complementary colors and colors that remind people of the four seasons. We used orange as the background color for fall, white for winter, light green for spring and light blue for summer. For text, we used colors that complement these and paid attention to contrast between light and dark colors. To further enrich our slides, we added sound.

3.2.3. Student Level

The intended audience for the materials that pre-service teachers designed was pre-school students. They stated that they considered the level of this audience when designing their materials.

R.A. I was happy to see that instructional materials design had considered not only design tools such as style, color coordination, balance and size, but also children's development levels and ease of use.

The answer to the second key research question: The perception of teacher candidates about the materials they designed following visual literacy training were as follows: (1) They paid attention to materials design during this process, made a great effort and appreciated their own products, (2) Visual literacy training and design tools affected materials design positively, (3) They considered the level of kindergarten children when they designed their materials, and found the process exciting and motivating.

3.3. Expert views on Design Tool use in Materials Designed by Pre-Service Teachers

According to the experts (Table 1), pre-service teachers were least good at depth. [Scale (M= 3.81), dimension (M=3.39) and texture (M=3.65)].

Table 1: Expert views on Design Tool use in Materials Designed by Pre-Service Teachers (n= 38)

Tools	M	SD
Color		
Figure-Ground	4.21	.74
Integration		
Use color to connect parts to whole	4.60	.49
Use color to match mood	4.21	.81
Simple Shapes	4.07	.81
Space and balance	4.13	.74
Depth		
Scale	3.81	.72
Dimension	3.39	.82
Texture	3.65	.74

The answer to the third key research question: According to expert opinion, the design tools in the instructional materials prepared by teacher candidates (1) were successful regarding color, integration, simple shapes, space and balance. (2) but not so successful regarding depth.

3.4. Reactions of Pre-School Students to the Materials Designed by Pre-Service Teachers

Pre-service teachers presented their materials at preschools and tried to observe student interest in the materials, their observations and thoughts. Table 2 presents the observation results (n=57). Six of the results are related with student behaviors towards materials, while the remaining 2 are related with pre-service teachers' materials use and effective communication with the students. The arithmetic means, which vary between 5 and 1 and show the observation level of the behavior, and standard deviation values are as follows:

Table 2: Observations on the Presentation of Instructional Materials at Pre-Schools (n= 57)

Behaviors of children and pre-service teachers	M	SD
1. Children watching the materials presentation with interest throughout	4.87	.33
2. Children frequently fixing their eyes on the materials	4.53	.63
3. Children having fun with the materials	4.78	.52
4. Children asking questions about the presentation and the materials	4.23	.76
5. Children answering questions correctly	4.55	.76
6. Children attending discussion or activities about materials presentation	4.55	.76
7. Pre-service teacher using materials effectively	4.80	.61
8. Pre-service teacher having effective communication with students	4.69	.65

Table 2 shows that pre-service teachers used the materials effectively and established effective communication with students ($M= 4.80$). The behaviors of pre-school students towards materials presentations showed that, other than item 4, all others had a mean over 4.50 or close to 5. In other words, pre-school students watched the materials presentations with interest ($M=4.87$). They asked few questions to pre-service teachers about the presentations and materials ($M=4.23$). This may have been caused by the fact that children frequently displayed the behavior in item 6, "attending discussion or activities about materials presentation" ($M=4.55$), and also that materials were based on interactive visual design. Other observations of pre-service teachers regarding the reactions of pre-school students to the materials they designed were as follows:

R.A. The children were very excited to see the flip chart posters, they resembled them to tents. One student said he liked the poster with numbers, and another said she liked the poster with pictures of objects in the same number as the written one. They were very willing to participate in the activity where they had to stick pictures in the proper places on posters about the concept of size. They invited us to visit their schools again.

F.U. The children were very quiet during the presentation, which surprised their teacher. She said they are normally very active and loud. Students really liked the images of plants and animals in the PPT presentation, the interactive design, and that the PPT screen changed according to their answers.

H.K. Students were excited to touch the posters and turn pages themselves.

The answer to the fourth key research question: Pre-school students reacted positively pre-service teachers' materials presentations. Therefore pre-service teachers aroused motivation to teaching profession.

4. Discussion

This study described the perceptions of pre-service teachers about visual literacy training, and the reflections of the design tools they learned during visual literacy training in the instructional materials they designed for pre-school students. Pre-service teachers improved their visual awareness and sensitivity with visual literacy training. In a study by Yeh & Lohr (2010) pre-service teachers also defined and noted the importance of visual literacy. Its competencies include sensitivity for visual and verbal associations (Avgerinou, 2009). Pre-service teachers believed in the importance of visual communication, and stated that it is also important for personality building. Visual literacy offers individuals the potential to organize their ideas, express themselves, set relationships with the world and build a self-image, thus developing self-confidence and a sense of independence (Ausburn & Ausburn, 1978). In instructional contexts, visual literacy focuses on purposeful communication. Visual communication, visual thinking and visual learning inevitably depend on visual literacy (Avgerinou, 2009). Visual literacy experiments in the classroom enrich pre-service teachers' visual experiences and trigger their thinking. Visual literacy studies have shown that "seeing" can be learned when looking (Feinstein 1994).

Velders (2000) also mentions that the important thing is to “learn to look”. From pre-school to university, teachers can increase student literacy in all fields where they need it. They may do so by not limiting themselves to using traditional printed texts only, but by also teaching their students how to read and see any visual document critically (Seglem & Witte, 2009). White (2012) held a study in which university students attended a film critique class related to visual and media literacy. Students were given information on cultural production as well as encouragement to use visual literacy skills, which were honed by the study. The critical thinking abilities of these students increased, and their self reflection and visual communication skills developed. In another study, English as a foreign language students were asked to produce learning materials by using web-based comic strip creation tool to facilitate the learning of grammar and sentences. It was found in the end that students not only learned the topic but also had elevated levels of motivation (Kılıçkaya & Krajka, 2012). Shermann and Lockee (2001) had students prepare electronic portfolios as visualizing outcomes in an online instructional technology master’s program. The students tried new and exciting ways to visualize their ideas and got a chance to reflect, synthesize and analyze through media. These two studies were experiments in visual literacy. Pre-service teachers were influenced by the importance of the tools of color (figure-ground), integration (using color to connect parts to whole, and to match mood), simple shapes, space and balance, depth (scale, dimension, texture) in visual design. Rotter (2006) recommended teachers to use design principles with the acronym COLA as they prepare instructional materials (contrast, orientation, lettering, and artwork). By following the COLA guidelines, teachers can improve their students’ ability to quickly and clearly grasp the main ideas and concepts presented. In Sosa’s (2009) study too, students focused on the principles of visual design and reviewed their own work with a more professional perspective; however, beyond recognizing visual literacy, they saw the benefits of visual design principles in practice.

Pre-service teachers not only created materials but became the critical consumers of visual materials. Visual literacy competencies for students include understanding the main elements, techniques and media of visual design, being able to view visuals critically, and pondering on them (Avgerinou, 2009; Oblinger, 2003). Rourke & O’Connor (2009) found astoundingly low levels of visual literacy among design students. This suggests that visual literacy training cannot be limited to design courses. Brumberger’s (2011) similar finding that the visual literacy levels of digital native university students were low shows that this ability does not develop on its own. Pre-service teachers stated that they made an intensive effort when designing their materials, were careful when using design tools, and ultimately liked the materials they created. In the ethos of the information age, doing is more important than knowing, and multitasking is a lifestyle (Oblinger, 2003). Students need support in becoming aware of how to create visual images and how to review them. They must be made aware that they deliberately need to use styles in their visuals to convince others (Bamford, 2001). Cochran (undated) suggests the following for visual literacy instructional strategies: Teacher candidates should be given opportunities for visual creation. Visual literacy experiences need to assess not just the product but also the learning process. Teacher candidates should be encouraged to develop, make an effort and criticize their own work. They were engaged in various tasks in a study in order to improve their visual and verbal literacy. They had difficulty in arts, but grasped the importance of being able to express themselves by drawing (Whitener-Lepanto & Harroff, 2002).

In their materials design, pre-service teachers were least successful in the use of depth. This study considered depth synonymous with scale, dimension and texture use. Depth – or scale, dimension and texture – make it easier for information to stand out and become selected (Lohr 2008, 270). Use of depth calls for more experience and expertise than other design tools of color, integration, simple shapes, space and balance. This is because depth is a subtle touch on design. The teaching of visual principles and tools is difficult as visual solutions to problems are subjective and may not be properly evaluated. On the other hand, visual solution-based images for intended audience problems are easy technological and inspirational products (Carter 2003, 78). Seen from this perspective, it is important when evaluating pre-service teachers’ use of design tools by also considering the reactions of the intended audience to the materials. Communication is not complete until the receivers understand messages. Informative materials should be legible, readable and worth reading for the intended audience (Pettersson, 1993). Research shows that most children are visually literate from birth to age 8 - 9 (Pettersson 1993, 101). Pre-school students watched pre-service teachers’ materials presentations with interest. They reacted positively and affectively to the visuals used in the materials. They interacted with these materials as if playing with them. Instructional materials have many functions in student learning such as “providing new learning stimuli” and “activating the student’s response” (Rowntree, 1976).

They can arouse readers' interest, curiosity, and motivation (Mayer, 2001; Mayer & Moreno, 1998; Unnava & Burnkrant, 1991). Walsh (2003) previously studied children's reactions to visuals in illustrated books, and observed intellectual, affective and esthetic responses. In this study too, pre-school students gave similar reactions to materials. Looking and seeing is a powerful way for young children to learn. (Phillips, 2005). Owing to the nature of child development, they evaluate peripheral clues in advertisements, such as color and images, not with their logic but with their emotions (Barry, 1998). There were several limitations to the study. The first one was the little amount of time available for visual literacy training. The second was that a comparison could have been made between pre-service teachers who had and had not received visual literacy training. Planning and implementing a study including the Perception aspect of the PAT model or one that covers the entire PAT model may offer a significant alternative to and complement Yeh and Cheng's (2010) study as well as this one.

5. Conclusions

Today, being able to read or write from left to right is not the only sign of effective communication. Visual literacy is the bridge to the world of multiple literacies and a democratic avenue for students to expose and compose their ideas. It must be included in all school curricula if teachers want to adequately prepare students for a world that is surrounded and driven by images (Seglem & Witte, 2009). Visual literacy should not be left to the discretion of a few lecturers at teacher education institutions, and it should not be limited only to the instructional technologies and materials design course but become an independent course in the curriculum. Visual literacy should not be seen as merely a support for the instructional technologies and materials design course. Visual literacy training can contribute to all courses taken before graduation which require pedagogical knowledge and skills, such as instructional planning and evaluation, instructional methods, and teaching practice, and also help teachers after graduation by equipping them with rich experiences and visual communication competencies.

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