



Pupils' Education Based on Design Learning: an Approach on Learning Performance

KEYWORDS

Children, Design, Learning performance, Design as curriculum

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ABSTRACT *There are common basic skills in children that are also components of design. The current research aims to study these skills in children as designers and the necessity of design as a part of the elementary school curriculum. To test the hypothesis, the authors held two design workshops for elementary first-graders. The results suggest that children, as consumers of design, can be trained to become designers and that a design appealing to children is pleasing to adults as well, but the reverse is not always true.*

1. Introduction

Everyone is a consumer of design. All individuals are involved in sort of a design during the day by choosing, moving objects, and picking shapes and colors (Norman, 2004). Children, as consumers of design who possess innate elements of creativity (Thaninayagam, 2014) and prediction about the future of technology-based design, are also under the most influence of their education environment (Farokhi & Hashemi, 2011; Tok, 2012; Karna, Bednarik & Vellonen, 2011) because they spend a lot of time there, and even outside this environment, they are under its supervision (Sali, Akyol & Baran, 2014). According to Fisher (2001), thinking is not a natural activity like sleeping or talking, but an activity that can be developed. Therefore, creativity, which is an element intertwined with elements like intellect and solution-finding, can be nurtured in pupils (Marques, 2014).

Given the influential role of schools in nourishing children and considering the effectiveness of design, this paper aims to study the importance of design, independent from drawing, in the elementary school curriculum, and the target group was specifically chosen to be the first-graders. The authors have tried to answer the question whether children can be trained to be the designers of at least what they mainly consume, and if it is necessary that design, like mathematics, be incorporated in the curriculum from the early years of school.

2. Children

Children's designs tell us of their present, past, and future (Oguz, 2010). Sometimes designing implies their farsightedness (Farokhi & Hashemi, 2011). Creativity, with prediction ability about the future (Tok, 2012), and attention (Beaty, Benedek, Wilkins, Jauk, Fink et al, 2014) are innate elements in children, which have similar definitions in different disciplines: having a sensitive flexible mind, imagination, 3D visualization, finding different and surprising solutions to problems, analyzing, and decision-making (Aizikovitch & Amit, 2011). Creativity and intellect are complementary (Ahmad & Shaheen, 2013) and when one is influenced, the other

is also affected (Rahimi & Hematian, 2012). Moreover, creativity and solution-finding have a close relationship due to the common constituent elements. There are four criteria for creativity: relevance and effectiveness, novelty, elegance, and genesis. Also, the four constituents of solution are being routine, original, elegant, innovative (Shen & Lai, 2014).

3. Children as designers

In the experiment by King (1995), which was performed to evaluate the influence of the environment on children aged 5-15, it was observed that 87% of children are clearly concerned about their environment and are influenced by it (Farokhi & Hashemi, 2011). Children pay special attention to the equipment of carpentry, tailoring and sewing, construction, etc., and can produce ideas in relation with such pieces of equipment and find new applications for them. In fact, by observing such objects, children create new games and toys in their environment (Benjamin, 2009). Their motivation and energy can also lead to finding other applications for a certain toy (Proenca, Quaresma & Vieira, 2014). A child's creative mind is always performing processes. Thinking and integrating is a kind of entertainment for a child, and reviewing their own thoughts helps them act in a more organized way (Marques, 2014). Therefore, design by children for the sake of education is a solution as to how various areas of knowledge can be consolidated (Teodora, 2014). When various areas of knowledge are integrated, we can be sure that a child-oriented product is designed and produced by its consumers, who are children themselves (Korhonen, Karna, Bednarik & Vellonen, 2011). For instance, children document their expectations and experiences while designing toys and games because playing and making games is an integral part of a child, whereas a designer uses only theoretical knowledge of children, (Kafai, Franke, Shin & Ching, 1998).

4. Design along with eye work

By eye movement, humans constantly analyze and explore their surroundings (Ruzickova & Hordejckukova, 2015). Vision system is the most important function system in a virtual environment. Vision quality is not con-

genital, but starts forming from birth to around 7 years of age. One's surroundings play a significant role in developing vision, and as a result, contribute to one's mental and physical growth, to the extent that the absence of proper visual stimuli leads to weak sensory perception (Sibert & Jacob, 2000).

In the present era, humans are in contact with human-like or nonhuman (object) VEs (Blascovich, Loomis, Beall, Swinth et al, 2002). A VE can represent a real-image world. However, in terms of naturalness, VEs still face some problems. There has always been attempts, by employing different fields of Design Interface Design, Emotional Design, Interaction Design, etc., to make VEs more similar to a human-robot in order to facilitate the mutual relations between the VE and the human. VEs are thus comprised of virtual humans as images or objects (Tanriverdi & Jacob, 2000).

5. Method

In this analytic cross-sectional study, we chose first-graders in a non-governmental male elementary school in northern Tehran to participate on two non-consecutive days. The advantage of these participants as a target group is that children at this age are able to write and have a stronger concentration and creativity. Although pre-school children, due to their imagination, are more creative, the illiteracy and lower concentration prevented us from choosing this group, and the target group was hence limited to the first grade.

To perform this research, an informal and stimulating interview was first designed so that children would be more motivated to take part. The researchers, who are designers themselves, aimed to eliminate obstacles to creativity such as ambiguity and fear, and assured the children that they have thinking and can be a chooser. The researcher, pretending not to know the answers, does this by asking questions such as Have you chosen this pencil case with this shape and application by yourself? What is your favorite color? Have you chosen your shoes yourself? This is because children should be aware of their power of choice. During the interview, each child tried to express his taste, visual literacy, and the level of concentration to his surroundings. The interviewer made sure that the children had a sound understanding of the concept of taste and perceived the differences in their taste, and competed with each other in this respect. This study was carried out in two stages.

In the first phase, after the introduction, the subject of the first design was presented to children through a story. We told them, "you receive milk from the school daily. The milk carton has become a problem after the consumption of the milk. It has made the environment ugly, so we should do something about this piece of garbage."

Then, they were asked to sketch their ideas with the help of paper, black pencil, and colors (free technique), and then start creating their design. They were even assured that they could choose a name for their milk carton later so that they could get more involved in the project and feel more like the creator. The sketching and modeling time considered was 30-45 minutes, which was the same for all children.

In the second phase, the second subject of design was

explained to the children through another story. They were asked, "are you happy with the school's environment? How would you like it to be?" Then, they were asked to draw their ideas on paper in the classroom with the available instrument (free technique), and next, to complete their designs in specific locations on the ground in the schoolyard with chalks. The allocated time for all children to sketch in the classroom was equally about 30-45 minutes, and the time for creating and locating the design in the yard was also 30-45 minutes.

These two phases were limited only to boys, and due to the limitations in space, time, and instruments, the designs were only done as pencil sketch by using available coloring instruments and paper sketch/model. Had we more facilities, the children could have created their designs more fully by using clay, color paper, and other instruments so that the design process of the milk carton that children receive daily in school and the child's friendly school could be studied with more precision.

6. Results

Our results show that the children became aware of their power of choice and gained the confidence to choose more fearlessly. They paid more attention to their surroundings, and in this way, improved their visual literacy and concentration. They engaged more in the design process and considered themselves more responsible as consumers of design. They could overcome the challenges in their minds by asking and answering questions. The results also reveal that their choice was connected with their individuality.

In the first phase, i.e. the design of a milk carton, most children saw the solution in designing a carton that they found desirable: one which is a toy and thus not considered garbage. Mobin, one of the students, designed a milk carton with which he could play during as well as after drinking milk. Also, due to his interaction with the carton, he chose a name for it, which amazingly reflects his level of creativity. He named his milk carton 'Mr. Shy'. To him, the straw is a character who lives in the carton. Through suction, the straw moves up and down, as if it were a shy person who hides and then shows himself playfully. This shows that, by comprising the elements of creativity, idea generation, and imagination, the design process can be highly enjoyable for children.

Figure1- Mobin' s milk carton without pencil sketch, with paper sketching- Phase 1



Figure 2- Eilya's milk pack with pencil sketch and paper modeling- Phase 1



In the second phase, i.e. designing a school appealing to children, as well as sketching on paper, the children sketched in a larger space: the schoolyard. In addition to creativity, we observed some prediction of technology-oriented design by the children, who can quite interestingly predict the future of technology. Their sketches, both on paper and ground, confirm this claim. Amir-Ali, another student, describes his desirable school as one that has a machine with special features in the corner of the school yard. By entering some data, this machine could change the colors of the clouds in the school's sky, any color that the students wish for. He also designed the machine in a way that it receives its energy supply from the clouds. In this phase of design, most children were inclined to design a product for the school yard, so that their school would become appealing to them. They also tended to design interactive technology-oriented products that repre-

sented the modern world of technology with special energy sources, those we might witness over the next two decades.

Figure 3- Amir-Ali's friendly school pencil sketch and presenting design in the school yard- Phase 2- Here



7. Conclusion

In the past two decades, eye work has increased, and it is no longer limited to reading, and we are constantly engaged in activities which require eye work. Using cell-phones, laptops, all digital screens around us, and driving are just a few examples. With the increase in eye work, seeing has also taken on more importance, and similarly, design has also assumed more significance. For instance, when a person uses a software application on his or her cellphone to talk to another person, the relationship he or she establishes with the cellphone is closer than that with the other person. That is why we are in contact more with the objects than with people nowadays – the objects that, in the best case, are in the form of robots as colleagues, friends, and gadgets. Therefore, in a world where there is more eye work than ever, the nature and meaning of design (3D design) are more crucial than ever. Now, children as design consumers, and not only the youngest design consumers, can be trained to become designers, as they could to become accountants, from the early years of education with the help of the two elements of 'creativity' and 'prediction about the future of technology-based design'. Considering the points mentioned above, this issue is so essential that in the future, an educational organization should be assigned to focus particularly on it, and by incorporating design into the school curriculum along with other school subjects such as mathematics and separate from laboratory and practical activities, respond professionally to children's ideas and opinions at elementary schools.

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