

How Do Preschool Children Express the Image of “Do Not Play with Fire” Through Drawing

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Abstract: Burns and accidents caused by children playing with fire are a leading cause of accidental death in Taiwanese children. This study attempted to explore how preschool children use drawings to express the image of “do not play with fire”. This study used a picture-projection technique and conducted interviews with 54 children aged 4 to 6 years old to investigate the theme “do not play with fire”. Qualitative analysis is used to analyze the drawing samples.

Among the expressions of “do not play with fire,” a “scene of fire” was mostly drew by the 6-year-old children, who mainly portrayed scenarios depicting the harms caused by playing with fire; “do not play with fire” was used by the 5-year-old children, who mainly used images to express the concept; and a “scene of fire” was used by the 4-year-old children, who mainly used lines to express attitudes and feelings. In terms of the visual representation of “do not play with fire”, the 6-year-old children tended to use symbol representation, mainly the cross; the 5-year-old children tended to use action representation, mainly the palm. Using simple and concrete images are able to inform children of possible injury, which effectively achieves the educational goals.

Key words: *Preschool Children, Children’s Drawings, Visual Representation, Projective Techniques*

1. Introduction

According to World Health Organization (WHO) statistics [33], accidents are the main cause of death and injuries, including head injuries, drowning, suffocation, electrocution, and burning, among preschool children [28]. Many of the victims of such injuries are between 2 and 6 years of age [2]. Burns and accidents caused by children playing with fire are especially threatening to the lives of children [27, 21]. Accidental injuries are the primary cause of death for Taiwanese children, and burn injuries are the focus of home accident prevention for young children aged 6 years and younger [45].

Accidental injuries in preschool children tend to be caused by curiosity, biological development, caregiver neglect, and a lack of warning labels [33, 39, 18]. Thus, the prevention of such accidents is a complex and multifaceted initiative. The results of related research have shown that the public’s understanding of warning labels is low [47, 11, 38, 15], especially among preschool children, who are more likely to experience accidents [7]. Currently, products on the market lack well-designed warning symbols, and they primarily evaluate the

usage preferences of adults without an in-depth understanding of the cognitive issues particular to children, who lack empirical experience or theory as a foundation for understanding [42, 31, 15].

It is difficult to survey preschool children's understanding of images, especially because young children's fear of unfamiliar environments, such as the laboratory, often result in incomplete oral expression. Testing in a natural environment could produce optimal results, and drawing is an approachable tool that can lower children's defenses and reduce the perceived threat to the subjects [37, 34]. Malchiodi (1988) and Campbell (2006) further noted that drawing is the most common way for preschool children to express their thoughts, feelings, and beliefs [26, 7]. Matthews (2003) likewise indicated that children explore the world around them and that pencil, brush and paper provide the best way for them to convey their hopes and most profound fears [28]. The picture-projection technique can thereby provide an understanding of children's psychological conditions and thinking models [37, 7, 24, 34, 3]. Children's drawing processes integrate feelings and intentions [26, 14]. Drawings thus can be explored to examine past experiences and convert them into new concepts and models [26, 28]. Nuttman-Shwartz et al. (2012) noted that children's drawings reveal the difficulties they have experienced and the coping strategies that they used to work through the experience and adjust to the situation [32]. When facing experiences such as disaster, fear, and illness, school-aged children can use drawings to express the scenes that occurred, which can help them understand the dangers that the disasters created [24, 3]. Altogether, research on children's drawings has shown that the picture-projection technique has the following effects: 1) It provides entertainment as well as physical and mental relaxation, 2) it helps children feel safer in unfamiliar environments; 3) it reduces children's homesick feelings, 4) it offers a method for relieving stress and expressing emotions, and 5) it helps children understand the purpose and methods of treatment and accept treatment or nursing interventions [43, 40, 24, 34, 44, 3, 36].

The minds and bodies of preschool children are still developing, as are their experiences and understandings of the world [35]. As children grow, their cognitive development is gradual and continuous [34]. Cognitive development begins with action representation, which typically begins before the age of 3, with which children understand the world through their physical actions [5]. Image representation means that children can use images to describe the world; when they grow older, children can use language, words, and symbols to gain knowledge during the symbolic representation stage [5, 35, 12]. On this point, Lesh et al. (1987) reported that "representation" refers to the code system used in the psychological process of modularization [23]. The code system may involve images, symbols, language and words, concrete operant objects, or other visual representations of children's cognitive concepts. Preschool children frequently use formal activities to express their understanding of life experiences and images [6, 15]. As related studies suggest, characteristics of images that facilitate preschool children's understanding of the intended meaning of the images are as follows: 1) images should conform to real-life experiences, 2) images should include objects from life that children are familiar with, and 3) an image's design should conform to what children can comprehend [17, 30, 38, 31, 46].

Building from a review of previous scholarship, through related research and according to findings below, we can more directly recognize the characteristics of preschool children's cognition of warning pictures: 1) children are not innately good at identifying some warning images, 2) the design of an image should conform to children's recognition and 3) characteristic of an image can enhance children's understanding of danger [25, 11,

47, 30]. For example, Loring and Wiklund (1988) investigated the warning signs of swimming pools for 5 to 10 years-old children, according to research finding, the poses and actions shown on the pictures should be specific in order to warn the public [25]. Considering this framework, Wogalter et al. (2002) and Mayhorn et al. (2006) proposed that it is necessary to base designs on images that can easily be understood by children to enhance their understanding of danger and, in turn, decrease accidents. Consequently, the present study included 4- to 6-year-old children as subjects and used picture-projection with the theme of “do not play with fire” to examine the children’s understanding of a specific danger. The children-respondents in this study used drawings to express their feelings [47, 30].

The purposes of this study were as follows: 1) to investigate how preschool children use images to express the concept of “do not play with fire”, 2) to compare how children of different ages use images to express the concept “do not play with fire” and 3) to understand how preschool children interpret representations of the concept “do not play with fire. Ultimately, the results gleaned from this study can provide a reference for designers to establish designs and instructional support when creating warning images for children.

2. Methods

2.1 Experimental design

This study used a picture-projection technique to explore how children between 4 and 6 years old express “do not play with fire”. A pre-test and children’s focus groups were conducted to reconfirm the feasibility of the survey. After modification, the official testing was conducted. This research as divided into two stages. The first stage consisted of picture-projection technique surveys. In the picture-projection surveys , the subjects expressed and drew the images with 12 color crayons on a 257x 364mm white paper to represent a topic about “do not play with fire” in a low-stress atmosphere. The second stage: One-to-one interview with subjects, it aims to find out the meaning of the images of “do not play with fire” in each drawing. After the interview, meta-communication is conducted and it aims to help children express themselves and validate the themes of painting [22]. Giffin (1984) thought that meta-communication satisfies the need for interpersonal communication and the need for rules used in coordinating matters with other people [10]. The tester interviews them regarding the content of image and invites children to explain the meanings of image [13].

2.2 Subjects

The subjects were selected by a convenience sampling of kindergartens. The kindergartens were located in central Taiwan and they approved the research agreement. Children’s parents’ provided written agreement and details related to the study. Interviews were conducted with the subjects to verify the extent of their comprehension, if the children showed difficulties with communication or interpersonal relationship; they were removed from the tests. After filtering for learning backgrounds and parental consent, 54 children (24 boys, 30 girls) ranging in age from 4 years, 6 months old to 6 years, 1 month old were selected as the research subjects. This study chose kindergarten and preschool children as research subjects because around the age of 5, children develop the ability to draw and use symbolic representation [12], and Mayhorn et al. (2006) investigated 3 to 6 years old children’s understanding of warning symbol, these studies indicated preschool children can describe images of life experiences [30].

2.3 Procedure and Materials

Pretest: The researchers conducted a pretest of “do not play with fire” drawings on three young children and then adjusted the test steps according to the results of the pretest.

Official test: The research location of this study was a kindergarten in Taiwan, and the whole class underwent the test as a group. Three classes were participated in this survey. The subjects’ seats were separated as much as possible to reduce the potential for observation and imitation, thus obtaining higher field validity for the children’s representations of the concept “do not play with fire.”

Before the test, the researchers and kindergarten teachers helped the children note their class and gender. Each child was given a 257x 364 mm drawing paper and 12 color crayons. In the interview, subjects’ basic information are recorded to enhance the analysis of works. Sound recording devices were used to record the overall interview process, and transcription machines were used to convert the interviews into electronic transcription files. The researchers classified and discussed the drawings with three early education teachers, using qualitative classification in content analysis [30], to classify the topics based on image features, such as shapes, activities and expressions.

2.4 Data analysis

After all of the test drawings were retrieved, a sample analysis was conducted as follows: Data classification: The collected drawings were collected, and the works were classified according to numbers, classes, and ages. Classification by drawing topics: the researcher discussed and analyzed the data with three early education teachers, and the content of the drawings was used to find themes with the same features, which were “do not play with fire” and “scene of fire.” Image analysis: The results of image analysis were based on the hermeneutics proposed by Betensky (2001) and included image meanings; composition elements; and the responses, emotions, and thoughts of the interpreters [4]. In addition, the perspectives of phenomenology were incorporated to analyze the subjects’ mindsets, behaviors, and interview responses. Finally, an university professor expertise in early childhood education and two preschool teachers helped to analyze the data results through a discussion to enhance the reliability of the overall results.

3. Results and Discussion

After reviewing all the samples, the themes were summarized as “do not play with fire” and “scene of fire” (Figure 1). Figures 1 show the image features of each topic. Images in the “do not play with fire” topic included child figures, open palms, and sources of fire, and they occurred in a total of 24 drawings. The “scene of fire” images included children playing with fire and causing major conflagrations resulting in the loss of life and property. A total of 26 drawings featured images related to this topic. Four works were characterized as other. The overall images, image representations, “do not play with fire,” and “scene of fire” images were discussed and used to create an integrated understanding of children’s expressions of the concept “do not play with fire.”

Subject	Do not play with fire				Scene of fire			
4-year-old children								



Figure 1. Image samples of children aged 4 through 6 years old

3.1. Analysis of the overall image

Table 1 shows that the 4-year-old children mostly drew “scene of fire” images (77.8%), the 5-year-old children mostly drew “do not play with fire” images (66.7%), and the 6-year-old children mostly drew “do not play with fire” images (50.0%), followed by “scene of fire” (38.9%). A comparison of themes showed that the topic “do not play with fire” was most often expressed by the 6-year-old children, followed by the 5-year-old children and the 4-year-old children; the topic “scene of fire” was most often expressed by 4-year-old children, followed by 6-year-old children and 5-year-old children. In order to understand differences among ages, chi-square is used for comparison. Statistical testing results showed (Table 2) significant differences ($\chi^2=9.450$, $p=0.009$) on the theme of not playing with fire. Among them, 5 children expressed the greatest (66.7%), children expressed the least (16.7%). In the topic of fire scenes, there were significant differences ($\chi^2=9.940$, $p=0.007$). Among them, 4 children expressed the greatest (77.8%), 5 children expressed the least (27.8%), both topics show significant differences in topic expression among children of different ages.

Table 1. Chi-square test of Do not play with fire and Scene of fire, number of people (percentage)

Subjects	4-year-old children N(%)	5-year-old children N(%)	6-year-old children N(%)	Total N(%)	Pearson	df	P
Do not play with fire	3 (16.7)	12 (66.7)	9 (50.0)	24 (44.4)	9.450(a)	2	.009*
Scene of fire	14 (77.8)	5 (27.8)	7 (38.9)	26 (48.1)	9.940(a)	2	.007*

Note : (*Significant Difference), $p<.05$

After a chi-square analysis, LSD test’s multiple comparisons (Table 2) and Table 3 are used to find differences in different ages. On the theme of not playing with fire, 6 year-old children (.036*, $p<.05$) and 5 year-old children (.002*, $p<.05$) have significant differences from 4 year-old children, which shows that preschool children have significantly different expressions of the topics. In the topic of fire scenes, 4 year-old children showed significant differences from 6 year-old (.002*, $p<.05$) and 5 year-old children (.015*, $p<.05$). Similarly, results showed that preschool children have significantly different expressions of the topics. Multiple comparison results showed that 6 and 5 year-old children have more similar expressions for the two topics, while 4 year-old children showed some differences in topic expression compared to other children.

Table 2. Post HocTests LSD Multiple comparisons of Do not play with fire and Scene of fire

Dependent Variables	(I) Age	(J) Age	Mean Difference (I-J)	Std. Error	P	95% Confidence Interval of the Difference	
						Lower	Upper
Do not play with fire	4-year-old	5-year-old	-.500(*)	.155	.002	-.81	-.19
		6-year-old	-.333(*)	.155	.036	-.64	-.02
	5-year-old	4-year-old	.500(*)	.155	.002	.19	.81

		6-year-old	.167	.155	.287	-.14	.48
	6-year-old	4-year-old	.333(*)	.155	.036	.02	.64
		5-year-old	-.167	.155	.287	-.48	.14
Scene of fire	4-year-old	5-year-old	.500(*)	.155	.002	.19	.81
		6-year-old	.389(*)	.155	.015	.08	.70
	5-year-old	4-year-old	-.500(*)	.155	.002	-.81	-.19
		6-year-old	-.111	.155	.476	-.42	.20
	6-year-old	4-year-old	-.389(*)	.155	.015	-.70	-.08
		5-year-old	.111	.155	.476	-.20	.42

Note : 1.(*)Significant Difference), $p < .05$

Table3 : LSD Multiple comparisons of Do not play with fire and Scene of fire

Subjects	Do not play with fire			Scene of fire		
Age	4-year-old children	5-year-old children	6-year-old children	4-year-old children	5-year-old children	6-year-old children
4-year-old children	—	—	—	—	—	—
5-year-old children	.002**	—	—	.002**	—	—
6-year-old children	.036*	.287	—	.015*	.476	—

Note : 1.(*)Significant Difference), $p < .05$; (**)Very Significant Difference) $p < .001$

2. Do not play with fire: 5-year-old children > 6-year-old children > 4-year-old children ; Scene of fire:

4-year-old children > 6-year-old children > 5-year-old children

On the whole, the 4 to 6 year-old children most often drew “scene of fire” images (48.1 %), followed by “do not play with fire” images (44.4 %). According to the results of the interviews, the children described about disasters caused by playing with fire; even when they had not personally experienced it, news reports or elders told them about the consequences of playing with fire, and the older children better comprehended that it is dangerous to play with fire. However, different age groups have different concerns. In terms of theme usage, Six-year-old children have good oral and drawing ability when describing disasters [26]; they are inclined to use “scene of fire” images and they described to use “burned-down house” and “goods on fire” images to symbolize the loss of life and property.

Piaget (2007) suggests that for 6-year-old children, some simple geometric pictures gradually become identifiable object combination [35]. Children start having the intention to express themselves and painting will be their communication measure. According to Malchiodi (1998), with the increase of ages and development, other parts and details are also increased [26].

Five-year-old children prefer the theme “do not play with fire”; through the interviews, they can use image forms to express concepts, and they have the ability to use symbols for representation [10]. Piaget (2007) suggested that regarding children’s cognition development, they gradually indicate things in environment or experience by symbols [35]. According to M, based on manipulation of simplicity principle, children have exaggerated and simplified drawing. For instance, tadpole humans in painting are the examples to indicate objects by simple forms.

Four-year-old children are inclined toward egotism and are less skilled at oral expression; their thoughts curious about the world. Therefore, their expression is usually the image of mental projection instead of object in reality. Many researchers call the painting of this stage as “concept painting”. It is the combination of children’s concept, memory and imagination of things [26].

3.2 Interpretation of the image “do not play with fire”

A “do not play with fire” composition is shown in Figure 2, the children’s descriptions with the hand, cross, and prohibition symbol representing “don’t”; red or orange zigzag lines representing burning flames and burn traces; and lighters and flames representing dangerous objects that can cause fires. In the “hand and fire” representation (Figure 2-1~6), children drawing an open palm is used to represent “don’t,” they said emphasizing “don’t” or “do not play with fire” as the visual representation. They also described that the significance of the images, the open-palm “hand” represents “don’t, stop”; and “fire” is represented with lines that represent burning flames and burn traces.

Children drew gestures to represent the meaning of “do not play with fire”. Children described that the “cross” is a symbolic representation to convey the meaning of “no” (Figure 2-7~9) and children have said to use cross out object images (Figure 2-10~12) or place a cross on the blank area next to the objects to represent “do not use.”

The results of the interviews indicated that 6-year-old children knew the meaning of “crosses” from their homework corrections. Children drew lighters with some fire on top of them (Figure 2-13~18) which represented a lighter may cause a fire; they described “*playing with a lighter would burn objects and cause a fire*”. It shows that preschool children already understand that playing lighters is very dangerous.



















Hand and fire						
	1	2	3	4	5	6
Cross						
	7	8	9	10	11	12
Lighter						
	13	14	15	16	17	18

Figure 2. Image representation 1

A 5-year-old child described his drawing (Figure 3) “*the hand means no, tells the other children that they cannot play with fire, playing with fire is very dangerous, hands will get burned, and it would hurt*”. In the image interpretation, the hand represents “no,” and the irregular lines represent fire, burns, and pain, which indicated the results of playing with fire. Cognitively, children between 2 and 7 years old are able to use symbols to represent physical objects [12]. The images drawn by children are also “markings” [26, 19]; children use the hand to describe “no,” and “no” is formed by “verbal language” to show that playing with fire causes burning and pain.

Children’s experiences of fear can utilize drawing to express real-life scenarios and express their motivation through “action images”, where language is used to accentuate the element of action [24, 20]. Malchiodi (1998) and Matthews (2003) suggested that children’s drawings contain intentional meaning. Those authors consider drawings as gestures and see the trace of action expressed in images [26, 33].



Figure 3. A 6-year-old child drew a hand to express “do not play with fire.”















Figure 4. A 6-year-old child drew a cross to represent “no” and added the lighters to express “do not play with fire.”

Figure 4 is the combination of “cross” and “lighter.” One 6-year-old expressed in an interview that “using lighters would burn the house down, and the ‘cross’ tells other children that this is not permissible.” Using crosses over lighter images expresses “fierce opposition” to using lighters, which further represents “do not play with fire.” In the “playing with fire” images, children used lighters and fire as image representations; they stated during interviews that they had seen fires on television and in the environment, and these life experiences are projected in drawings [26].

Children’s understanding of graphic symbols is the basis of perception, cognition, and action [1, 6, 14], Arnheim (1974) pointed out that children’s learning features are the operations of perception, visual perception, and cognition [18]. Results showed that children can use experiences to express concepts for images. For instance, 6 year-old children would use hands and crosses to express “don’t” A found that 8 year-old children use “hand” to express stop, and 6 year-old children use “gray lines” to express roads [16]. Even though children’s cognition of images is from concrete to abstract [8], in particular, they need to learn abstract images in order to understand them [44, 8], but in this survey they are able to use simple forms, basically in the images that they can accept, learn, and relate to.

3.3 Interpretation of fire scene images

In terms of the “fire” representation (Figure 5-1~6), the children sometimes tracing a flame shape to express danger, they used lines or color blocks which tend to be strong zigzag lines, shaking or fragmented and messy lines In the “house” representation (Figure 5-7~12), the children generally focused on buildings and high-rises along with large fires and black smoke. According to the results of interviews, sometimes they had seen the fire on television or street, and it is a very terrifying experience for them to see fires and houses burning down. The “children playing with fire” representation (Figure 5-13~18) was generally shown a little girl or little boy holding a torch or a match to represent “playing with fire”, one of the children described “to *represent playing with fire, the boy or the girl in the drawing has to hold a torch*”. It shows that the children could use action symbols to express “playing with fire”.

Fire						
	1	2	3	4	5	6
Houses						







	7	8	9	10	11	12
Children playing with fire						
	13	14	15	16	17	18

Figure 5. Image representation 2

In Figure 6, a 6-year-old child described, “*Playing with fire would result in a big fire, burning down the house, and there should be stickers in the house that tell children they should not play with fire and torches.*” In terms of image interpretation, children use “prohibition of torch symbols” to represent “do not touch a torch” and a burning house conveys the scene after playing with fire. In terms of the image context, the children’s images indicate that playing with fire will result in losses of life and property, and the image of “do not play with fire” appears very small, showing that they can imagine and fear fires and that they fear death.

A 6-year-old child described “*Using a lighter would cause big fires with black smoke, and the fire would burn nearby objects and create dangerous fire*” (Figure 7). The image interpretation shows that children combine the “prohibited” symbol with the lighter to express “do not play with fire,” and the fire and black smoke convey the dangers of playing with fire. The above children’s drawing works show that the scenes of disaster indeed represent a great threat to preschool children [9], who retain a strong imagination, fear, and a sense of danger regarding fire. According to children’s experience, they understand a fire can burn down the house, and even threaten the life.

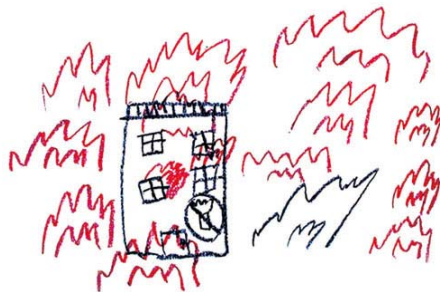


Figure 6. The 6-year-old children represented “do not play” with fire graphics on the outside walls of houses to express that playing with fire will burn houses.



Figure 7. The 6-year-old children drew a combination of lighters and “prohibited” symbols to express that playing with fire can cause a fire.

Arnheim (1974) proposed that children would observe differences in matters and simplify them for partial incorporation [21]. Perice’s semiotic theory explains that guide symbols express images through the influence of observation [39]. Results of this study showed that preschool children would combine symbols, environments, and events. Similarly, other studies showed, for instance, 4 year-old children drawing mother and the sun to express an ideal hospital [34], 5 year-old children using semi-circles and sad faces to express disaster [24]. These results also showed that children would combine features of images with emotions, and they would associate based on emotions and attach symbols to them.

4. Conclusions

Based on the results, this study suggests that when designing the image of “do not play with fire”, the following points should be emphasized:

1) The images must conform to the visual element of “meaning” and should focus on knowledge that preschool children can accept to effectively help children understand the “danger” that the image is trying to convey.

2) Visual images that are simple and familiar should be used to “inform” children of possible injury, “familiar objects” should be simple, easy to remember, and easy to pronounce, and the images should not be simplified too much, resulting in excessive abstraction and inability to understand.

Children would use past experiences and ideas to express, so forms must be easy to read, familiarize, and clarify. In interpreting scenes of fire, results showed that preschool children would combine symbols, environments, and events, to express the damage after playing with fire. Children emphasize connecting matters to feelings and memories, and would associate based on images and emotions, then connect them to symbols. Thus, drawing techniques can be seen as a research method that helps image design, and future evaluations of this study can conduct interviews with children and content analysis to derive comprehensive data.

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5. References and Citations

- [1] Alerby, Eva; 2000, *A Way of Visualising Children's and Young People's Thoughts about the Environment: A study of drawings*. Environmental Education Research 6, 3, 205–222.
- [2] Alkon, Abbey; Ragland, David R.; Tschann, Jeanne M.; Genevro, Janice L.; Kaiser, Pamela W.; and Thomas, Boyce; 2000, *Injuries in child care centers: gender-environment interactions*. Injury Prevention 6, 214–218.
- [3] Aminabadi, Naser Asl; Ghoreishizadeh, Arezoo; Ghoreishizadeh, Mohammadali; and Oskouei, Sina Ghertasi; 2011, *Can drawing be considered a projective measure for children's distress in paediatric dentistry*. International Journal of Paediatric Dentistry 21, 1, 1–12.
- [4] Betensky, Mala; 2001, *Phenomenological Art Therapy*. Approaches to art therapy: Theory and technique 2, 121-133.
- [5] Bruner, Jerome S.; Olson, David R.; 1977, *Symbols and texts as tools of intellect*. Interchange 8, 4, 1–15.
- [6] Callaghan, Tara C.; Rochat, Philippe; MacGillivray, Tanya; and MacLellan, Crystal; 2004, *Modeling Referential Actions in 6- to 18-Month-Old Infants: A Precursor to Symbolic Understanding*. Child Development 75, 6, 1733–1744.
- [7] Campbell, Susan B.; 2006, *Behavior Problems in Preschool Children: Clinical And Developmental Issues*. Guilford Pubn.
- [8] Carlson, Stephanie M.; Davis, Angela C.; and Leach, Jamie G.; 2005, *Less Is More: Executive Function and Symbolic Representation in Preschool Children*. Psychological Science 16, 8, 609–616.
- [9] Coffman, Sherrilyn; 1998, *Children's Reactions to Disaster*. Journal of Pediatric Nursing 13, 6, 376–382.

- [10] Cosby, Rogers S.; Janet, Sawyers K.; 1988, *Play in the lives of children*. Washington, DC, US:National Association for the Education of Young Children.
- [11] Davies S.; Haines, H.; Norris B.; and Wilson JR.; 1998, *Safety pictograms: are they getting the message across*. *Applied Ergonomics* 29, 1, 15–23.
- [12] Diane, Papalia E; Wendkos, Olds Sally; and Duskin, Feldman Ruth; 2007, *A Child's World: Infancy Through Adolescence*. McGraw-Hill College.
- [13] Driessnack, Martha; 2005, *Children's Drawings as Facilitators of Communication: A Meta-Analysis*. *Journal of Pediatric Nursing* 20, 6, 415–423.
- [14] Einarsdottir, Johanna; Dockett, Sue; and Perry Bob; 2009. *Making meaning: children's perspectives expressed through drawings*. *Early Child Development and Care* 179, 2, 217–232.
- [15] Gane, Patricia A.; Pickard, Megan Bloom; and DeLoache, Judy S.; 2008, *Transfer between picture books and the real world by very young children*. *Journal of Cognition and Development* 9, 1, 46–66.
- [16] Gorla, Sophia; Papadopoulou, Maria; 2012, *Icons versus symbols: investigating preschoolers' cartographic design*. *Journal for Theoretical Cartography* 5, 1–18.
- [17] Hämeen-Anttila, Katri; Kemppainen, Kati; Enlund, Hannes; Bush, J Patricia; and Marja, Airaksinen; 2004, *Do pictograms improve children's understanding of medicine leaflet information*. *Patient Education and Counseling* 55, 3, 371–378.
- [18] Kendrick, Denise; Coupland, Carol; Mason-Jones, Amanda J.; Mulvaney, Caroline; Simpson, Jayne; Smith, Sherie; Sutton, Alex; and Watson, Michael; 2009, *Home safety education and providing safety equipment for injury prevention*. The Cochrane Collaboration and published in The Cochrane Library 7.
- [19] Kindler, Anna M.; 1997, *Child Development in Art: Natl Art Education Assn*, 16–44.
- [20] Kindler, Anna M.; Darras, Bernard; and Kuo, A; 1998, *Children and the world of art: Conversations with preschoolers and kindergartners about art, artists, and creativity in three cultures*. *Canadian Review of Art Education* 25, 1, 67–82.
- [21] Kholshchevnikov, V. V.; Samoshin, D. A.; and Parfyonenko, A. P.; Belosokhov, I. P.; 2012, *Study of children evacuation from pre-school education institutions*. *Human Behaviour in Fire* 36, 5-6, 349–366.
- [22] Kvale, Steinar; 1997, *Interviews. An introduction to qualitative research interviewing*. London: Sage Publications.
- [23] Lesh, Richard; Thomas Post; Merlyn J. Behr; 1987, *Representations and translations among representation in mathematics learning and problem solving*. In C. Janvier(Ed.). *Problems of representation in the teaching and learning of mathematics*. Hillsdale, NJ:Erlbaum, 33–40.
- [24] Looman, Wendy Sue; 2006, *A Developmental Approach to Understanding Drawings and Narratives From Children Displaced by Hurricane Katrina*. *Journal of Pediatric Health Care* 20, 3, 158-166.
- [25] Loring, Beth A.; Wiklund, Michael E.; 1988, *Improving Swimming Pool Warning Signs, Human Factors and Ergonomics Society Annual Meeting Proceedings*. *Safety* 5, 910–914.
- [26] Malchiodi, Cathy A.; 1998, *Understanding Children's Drawings*. London and New York: Jessica Kingsley.
- [27] Morrongiello, Barbara A.; Schwebel, David C.; Bell, Melissa; Stewart, Julia; and Aaron, Davis L.; 2012, *An evaluation of The Great Escape: Can an interactive computer game improve young children's fire safety knowledge and behaviors*. *Health Psychology* 31, 4, 496–502.
- [28] Matthews, John; 2003, *Drawing and Painting: Children and Visual Representation : 0-8 Years: Sage Pubns*.

- [29] Matthew, Miles B.; Michael, Huberman A.; 1994, *Qualitative data analysis*. 2nd ed. Thousand Oaks: Sage Publications.
- [30] Mayhorn, Christopher B.; Wogalter, S M; and Mendat, C. C.; 2006, *The Matching Game: Educating Children about Household Hazards and Warning*. Safety Issues for Children and Children's Products, 21–26
- [31] McKnight, Lorna; Read, Janet C; 2009, *Designing the 'Record' Button: Using Children's Understanding of Icons to Inform the Design of a Musical Interface*. IDC '09 Proceedings of the 8th International Conference on Interaction Design and Children, 258–261.
- [32] Nuttman-Shwartz, Orit; Huss, Efrat; and Altman, Avital; 2010, *The Experience of Forced Relocation as Expressed in Children's Drawings*, Cinical Social Work Journal 38, 4, 397–407.
- [33] Peden, Margie; Kayode Oyegbite; Joan Ozanne-Smith; Adnan A. Hyder.; Christine Branche; Fazlur Rahman AKM; Frederick Rivara.; and Kidist Bartolomeos; 2008, *World report on child injury prevention*, World Health Organization.
- [34] Pelander, Tiina; Lehtonen, Kimmo; and Leino-Kilpi, Helena; 2007, *Children in the Hospital: Elements of Quality in Drawings*. Journal of Pediatric Nursing 22, 4 , 333–341.
- [35] Piaget, Jean; 2007, *The Child's Conception of the World: Rowman & Littlefield Pub Inc*.
- [36] Priya, Kumar Ravi.; 2012, *Trauma Reactions, Suffering, and Healing among Riot-Affected Internally Displaced Children of Gujarat, India: A Qualitative Inquiry*. Qualitative Research in Psychology 9, 189–209. [37] Rollins, Judy A.; 2005, *Tell me about it: Drawing as a communication tool for children with cancer*. Journal of Pediatric Oncology Nursing 22 ,4, 203–221.
- [38] Rother, H A.; 2008, *South African farm workers' interpretation of risk assessment data expressed as pictograms on pesticide labels*. Environmental research 108, 3, 419–427.
- [39] Sanders, Peirce Charles; 1991, *Peirce on signs: Writings on semiotic by Charles Sanders Peirce*. University of North Carolina Press.
- [40] Salmon, Karen.; Wendy Roncolato; and Melanie Gleitzman; 2003, *Children's reports of emotionally laden events: Adapting the interview to the child*. Applied Cognitive Psychology 17, 65–69.
- [41] Simpson, Jean C.; Turnbull, Bianca L.; Ardagh, Michael; and Richardson, Sandra; 2009, *Child home injury prevention: understanding the context of unintentional injuries to preschool children*. International Journal of Injury Control and Safety Promotion 16, 3, 159–167.
- [42] Smith-Jackson, Tonya L.; 2002, *Child-Centered Safety Research Issues*. The Proceeding of the XVI Annual International Occupational Ergonomics and Safety Conference, 1–6.
- [43] Stafstrom, Carl E.; Kevin Xstasy; and Anna Minster; 2002, *The Usefulness of Children's Drawings in the Diagnosis of Headache*. Pediatrics 109, 3, 460–472.
- [44] Trollvik, Anne; Nordbach, Reidun; Silén, Charlotte; and Ringsberg, Karin C.; 2011, *Children's Experiences of Living With Asthma: Fear of Exacerbations and Being Ostracized*. Journal of Pediatric Nursing 26, 4, 295–303.
- [45] Tung, Kwang-Yi; Mei-Lin Chen; Hsian-Jenn Wang; Ging-Song Chen; Michael Peck; Jingzhen Yang, and Chih-Ho Liu; 2005, *A seven-year epidemiology study of 12,381 admitted burn patients in Taiwan—using the Internet registration system of the Childhood Burn Foundation*. Burns 31, 1, 12–17.
- [46] Waterson, Patrick; Pilcher, Cara; and Evans, Sian; Moore Jill; 2012, *Developing safety signs for children on board trains*. Applied Ergonomics 43, 1, 254–265.
- [47] Wogalter, Michael S.; Laughery, Kenneth R.; 1996, *WARNING! Sign and Label Effectiveness*. Current Directions in Psychological Science 5, 2, 33–37