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Czech Children's Drawing of Nature*

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Abstract

Do world children draw nature pictures in a certain way? Range of mountains in the background, a sun, couple clouds, a river rising from mountains. Is this type of drawing universal in the way these nature items are organized on a drawing paper? The sample size from Czech Republic included 33 participants from two kindergartens. They were 5 and 6 years old. The number of boys was 14 and the number of girls was 19. The first step of the data obtaining was the contact with the teacher, who was present in the class during all collection of data. Czech children's nature drawings did not support the assumption of a universal type of children's nature drawings.

Key Words

Czech Children, Universal, Nature Drawings.

Young Children's Perception of Environment, Attitude towards Environment and their Environmental Behavior

In the past and also nowadays, in the world is interest in environmental problems. There are existing organizations, which are trying to protect environment and nature. The environmental problems reach everywhere; they are not unique for one zone of planet, they are regarding to whole planet and for every human. On the basis of these facts, the environmental education is becoming an integral part of the education of any country's youth. The important of environment for the humans should be support from the early years of children.

In the literature many models are presented related to environmental behavior. In the beginning of 1970s, earliest and most basic version of environmental behavior models were constructed on a vertical advancement of environmental knowledge leading to environmental consciousness and concern, which in return was believed to lead to pro-environmental behavior. These realistic models presumed that instructing individuals about environmental concerns would inevitably result in additional pro-environmental behavior, and Burgess, Harrison, and Filius (1998, p. 1477) have named these "deficit" models of public understanding and action.

Hines, Hungerford and Tomera published their Model of Responsible Environmental Behavior in 1986, which was grounded on Ajzen and Fishbein's theory of planned behavior (Hines et al., 1986/87; Hungerford & Volk, 1990; Sia, Hungerford, & Tomera, 1985). They performed a meta-analysis of 128 pro-environmental behavior research studies and introduced the subsequent six variables that are linked with responsible pro-environmental behavior (Kollmuss & Agyeman, 2002). First variable is *Understanding of Issues* which means people need to be familiar with environmental problems and their causes. Second one is *Knowledge of Action* strategies which indicates people need to know how to act to decrease their negative impact on the environment. Third one is called *Locus of Control* that represents people's perception of whether they

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have the ability to bring about change through their behavior. People with a strong internal locus of control believe that their actions can bring about change. People with a strong external locus of control, however, feel that their actions are unimportant and change can be brought about only by powerful others. Fourth variable is named as *Attitudes* which imply people with strong pro-environmental attitudes were uncovered to be more likely to involve in pro-environmental behavior. Though, the link between the attitudes and the actions found to be weak. The fifth one is *Verbal Commitment* in which the communicated enthusiasm to take action also signaled people's enthusiasm to involve in pro-environmental behavior. The last one is called *Individual Sense of Responsibility* which points people with a superior sense of responsibility are highly likely to involve in environmentally responsible behavior (Kollmuss & Agyeman).

Bonnett and Williams (1998) conducted a study on how 5/6 years old children in United Kingdom perceived nature. In this study, they used interview as a research method. They demonstrated high levels of feeling and general concern towards nature and the environment. Authors highlighted a children's strong empathy towards certain aspects of nature particularly animals and trees. From the earliest studies, for example Palmer (1995) realized research on 4 – 6 years old children from United Kingdom and United States and found out, the children had got a good knowledge about environment and nature and children know to explain some basic concepts, like recycling.

Other studies used the experimental methods (Lisowski & Disinger, 1991; Manzanal, Barreiro, & Jimenez 1999). Both studies has got similar research design, as it was mentioned above, the experimental method was used, the experimental group realized fieldwork and the result was expected. The respondents form this group achieved better score, their knowledge about environment and nature was better in comparison with respondents from control group. In both studies were respondents pupils ages of 14–16.

Other studies are regarding to assessment of environmental problems by respondents. For example, Uzzell, Rutland, and Whistance (1995) found out, that children rate distant global problems as more serious than local ones and they tend not to make connections between local actions and global effects. Next, there were investigated ideas of different environmental problems. Boyes, Stanisstreet, and Papantoniou (1999) investigated ideas of high school students about ozone layer. Ideas about ozone layer was also investigated Österlind (2005), next were investigated ideas about acid rain, greenhouse effect (Andersson & Wallin, 2000; Dove, 1996), global warming (Kılınç, Stanisstreet, & Boyes, 2007), air pollution (Myers, Boyes, & Stanisstreet, 1999). The studies of local (Czech) character are not known. Our study is the first, which is regarding to the problematic of children's perception of the nature.

The most used method of data acquiring are tests and questionnaires. These ones were presented in all studies, which are above. Our research method was children drawing. Many studies were used drawing methodology in various fields: Psychology, Art Education, Science Education, Mathematics Education, and Biology (Golomb, 1994). There are several reasons for the researchers to use drawing method. They are documented in the literature as follows: First, researcher believed that drawing is a powerful instrument to gain insight about children's thinking, emotions, experiences and perceptions (Malchiodi, 1998; Piaget, 1951; Piaget & Inhelder, 1967; Prokop & Francovicova, 2006). Second, drawing provides a comfortable atmosphere for the children to express their thoughts and emotions freely and also drawings carried various communicative messages (Weber & Mitchell, 1996). Third, drawing is a more convenient way of communication for the children who are afraid of expressing themselves verbally or who have speaking difficulties (Reiss & Tunnicliffe, 2001). And last, "drawings provide a multidimensional view of children" (Borthwick, 2011, p. 38).

Some of the examples of drawings studies in the literature are: Prokop, Kubiatko, and Fancovicova (2007) examined the factors that may effect students' understanding of animal skeletons, Bortwick (2011) examined students' perception of mathematics courses in the schools, Matthews (2003) investigated the role of drawings as a tool for understanding how adults express their emotions, Ulker (2012) investigated how Turkish students drew nature, Prout and Phillps (1974) investigated students' school experiences and Huber and Burton (1995) examined students' perception of scientist. All these studies use drawing method to gather data about either individual's perception, knowledge level, emotions and experiences. Drawing provides an objective projection of individual insights (Prokop & Fancovicova, 2006). According to Prokop and Fancovicova unlikely other data collection methods (clinical interviews, open ended questionnaires) to gain information about individuals' thinking, emotions, experiences and perceptions, drawings are more objective and easier for quantification.

The situation in the Czech conditions regarding to drawing of nature and also with the using of drawings in the science education research is relatively low. There exists only works, where the children drawings are characterized in the theoretical context. The one common research including drawing is the drawing of the tree, but it is in the psychological context, where the character of the tree drawing is connecting with the perceptions of human. On the basis of this fact it is out of our research. The perception of the nature of is investigated on very low level in the Czech Republic, when the investigation is realized it is mostly by the questionnaires or didactic test, the drawing is very rare and when it is realized, it is mostly in the form of bachelor or diploma thesis. The respondents are mostly lower secondary school pupils.

Nature Education in Czech Republic

Nature education in the Early Childhood Education is defined in the framework educational program as the intention of teachers education efforts is in the environmental field to challenge an elementary awareness of the world around and its changes, of human impact to the environment beginning in his nearest neighborhood and reaching the global problems of planetary importance and to lay down the elementary bases for an open and responsible attitude of child and adult to the environment (Cıkánová, 1992; Vancant & Riha, n.d). According to Vancant and Riha, and Cıkánová, part of education target and what should teacher support in children can be listed as follows: Firstly, they need to inform the child about the locality and its structure where the child lives and to build child's positive relation to this place. Secondly, teachers should build up an elementary awareness about the broader natural, cultural and technical environment, its diversity, development and continuous metamorphoses. Thirdly, they should create the learning environment in which students become acquainted with other cultures, develop the adaptability to conditions of outer habitat and its changes, to develop the respect to life in all its forms, and adopt the empiric experience and skills needed to provide simple operations caring for the neighborhood and to participate so in building healthy and safe environment and in protection of the child against dangerous impacts. Finally, they should help students to understand the changes caused by human activity can protect and improve the environment as well as to damage and destroy; and build up the awareness of fellow feeling to the world, to the animated and unanimated nature, to humanity, society and to the planet Earth.

Nature education in the *elementary education* is included under the educational area, Man and Nature. This area involves a variety of topics linked to the examination of nature. It equips the child with the tools and methods for a better understanding of natural facts and their innate laws, hence providing him/her with the necessary foundation for a deeper grasp and utilization of modern technologies and helping the child better orient himself/herself in everyday life. In this educational area, the child is given an opportunity to become familiarized with nature as a system that its components are interconnected, interact with each other and affect one another (EACEA, 2009). This kind of knowledge is furthermore the foundation for the understanding of the importance of maintaining the natural balance of the existing living systems, including humans. Moreover, this educational area notably supports the establishment of alternative viewpoints (open thinking), critical and logical thinking (Cıkánová, 1990).

According to Framework Education Programme for Elementary Education (FEP EE, 2007) the instruction in this educational area is targeted at establishing and developing key competencies by directing the children towards. These competencies can be stated as; first one is evaluating the importance, reliability and accuracy of collected natural science data in order to confirm or disprove previously communicated hypotheses or conclusions, second is examining natural facts and their interconnections while utilizing observation, measurement, and experiment as empirical methods of cognition along with various rational methods, third one is demanding to ask questions vis-à-vis the course and reasons of numerous natural processes, to formulate these questions accurately and to seek satisfactory answers to them, and such thinking that requires validating stated hypotheses on natural facts through various independent methods; fourth one is starting to be engaged in activities targeted at thoughtful behavior towards natural systems one's health and the health of others; fifth one is thinking and acting in a way that chooses as effective use of energy resources in practice as possible, including the broadest use of renewable energy resources possible; in particular solar radiation, wind, water

and biomass, sixth one is developing the skills to act suitably when encountering substances or situations, that signifies a prospective or real threat to the life, health, property or environment of human being and last one is understanding the links between individual activities and the state of the natural and living environments.

Importance of Geometry and Spatial Reasoning in Drawings

Geometry and spatial reasoning is important to perceive the actual physical world around us (Clements, 1998). Freudenthal (in National Council of Teachers of Mathematics, 1989) defined geometry as:

> *… grasping space… in which the child lives, breathes and moves. The space that the child must learn to know, explore, conquer, in order to live, breathe and move better in it (p. 48).*

As a result we cannot think geometry separate from physical world, including nature, around us. Furthermore, geometrical reasoning form a base for further mathematical thinking and projecting and reflecting objects in the real world (Clements, 1998). Spatial thinking is playing important role while interpreting and understanding inherently geometric world around us (NCTM, 1989). As a result while student draws the nature picture their level of geometrical thinking and their spatial thinking ability may affect how they reflect the objects in the nature on a drawing paper. According to Jones and Mooney (2003) both geometrical and three-dimensional (3-D) thinking is related with mathematics curriculum and real life situations. Although developing these thinking is so important a few research were conducted on 3-D geometry (Presmeg, 2006). Moreover, 3-D geometry teaching gets little attention in most mathematics curriculum and students are only engaged in plane representations of solids (Battista, 1999; Ben-Chaim, Lappan, & Houang, 1989). Thus, promoting geometry reasoning starting from early ages may have effect on how students perceive the objects around them with their properties.

According to Piaget and Inhelder (1967) children construct ideas about space in geometry that is called as "representational space". Young children first perceive at most one or two properties an object by touching (Piaget & Inhelder). As children get older they start to relate those properties with each other. In this stage children's understanding of shapes engage the action of observing, touching and mentally relating those actions. According to Piaget as children get older they started to perceive Euclidean relations and project the objects.

Spatial orientation is an important construct which means knowing your actual position and understating and operating different locations and positions in the physical world with respect to your position. Spatial orientation of the objects on a drawing paper is also related with how children process their mental maps about the nature around them. For instance why they allocate typically 1/4th of the drawing paper for drawing sky (Ulker, 2012). According to Clements (1998) "young children slowly develop many different ways to represents locations of objects in the space" (p. 13). Presson and Somerville (1985) indicated that young children can locate near objects but cannot relate these objects to distance landmarks. For instance, Huttenlocher and Newcombe (1984) stated a 4 years old child could make mistake as they locate objects in near distant when they change their initial orientation. In kindergarten children start to organize and build local maps that are less dependent to their own orientation. By third grade a child can comprehensively perceive the locations and include effects of the observer orientation as they locate the objects for instance in his or her drawing. This progressive development in spatial orientation may explain why young children draw some nature items in a certain way. For instance, Turkish children typically locate the sun in the middle of the sky and with typical size of a coin (Ulker).

The purpose of this study was to investigate to find out whether Czech Children are drawing nature in a certain way; Range of mountains in the background, a sun, couple clouds, a river rising from mountains. Is this type of drawing universal in the way these nature items are organized on a drawing paper?

Method

The sample size from Czech Republic included 33 participants from two kindergartens. Kindergartens were localized in the southeast of the Czech Republic, where the surface of the country is flatland with the highest point about 800 meters over sea. The climate is warm with average temperature 9.5 °C. Eleven relatively big rivers flow through this region and there lie two big water dams. The character of country is contained from meadows, vineyards and forest (coniferous, deciduous and also mixed).

Data Collection and Data Analysis Procedures

The sample size from Czech Republic included randomly selected 33 participants from two kindergartens. They were 5 and 6 years old. The number of boys was 14 and the number of girls was 19. The first step of the data obtaining was the contact with the teacher, who was present in the class during all collection of data. After the required consents were obtained, researchers entered the research site. In the classroom first researcher distributed sheet of paper (A4) and pencils (colored) for whole class. Next, we explained to children what we would do. Following descriptor was used to inform about students' responsibilities: "Please draw a nature picture on the white paper in front of you". Then the children draw the nature, if they had got any problem researcher or teacher were explaining the problem. The time of nature drawing was between 20 to 40 minutes. The coding schema was determined based on the study that Ulker (2012) conducted. Table 1 shows the coding schema of the study.

Table 1.
Coding Schema of the Study (Ulker, 2012)

Categories	Description
Presence of river	Student draws a river that typically originates from a mountain (typically river flow direction is from right corner to left corner of the drawing paper)
Shape, size and location of Sun (right-left-mid)	Student locates the sun as follows: 1. Typically in the middle of the sky with circular shape (typically size of a coin size) 2. On the right of left corner of the mountain range or the paper with non circular shape (as if newly rising sun, typically size of 1/4th of a coin size) 3. Between two of the mountains with non circular shape (as if newly rising sun, typically size of 1/3rd of a coin size)
Space Allocation for Sky	Student allocates typically 1/4th of the top part of the drawing paper for picturing sky. Students clearly separate a certain space for the sky from the earth in their drawings.
Shape and Location of Clouds (linear)	Student draws linear curvy clouds into the specific space that was allocated for the sky.
Mountain Range	Student draws mountain range under the space on the drawing paper that was allocated for the sky.

Each drawing was sorted under related categories by two independent researchers. Next, the level of agreement among researchers was found %96. Then frequency count of each category was determined and percentage distribution of drawings under each category was calculated. At last, student nature drawings work samples were selected for reporting purposes.

Findings

In this section the data will be reported from the perspective of five and six year old Czech students. At those ages students' drawings include similar elements in their drawings. In Table 2 displays frequency counts of students' drawings under each category from both five - six years old students.

Table 2.
Shows the Number of Drawings in Each Category for Five and Six Year Old Students

Category	Label	Number of Drawings from 5 -6 years old Students	Total Number of Drawings
Presence of river	A	0	33
Shape, size and location of the sun	B	25	33
Space allocation for sky	C	16	33
Shape and location of clouds	D	18	33
Presence of mountain range	E	1	33

Table 2 shows that despite Turkish students (Ulker, 2012), overall, across 33 Czech students' drawings, none of the students drew a river that originates from the mountains. In the shape, size and location of the sun category, 25 out of 33 students' drawings were classified under this category. This finding indicated that typically Czech five and six year old students drew sun either in the middle of the sky with circular shape, or on the right or left corner of the mountain range as if newly rising sun, or between two of the mountains as if newly rising sun in their nature drawings. For the next category, 16 out of 33 students' drawings were an exemplar of allocating a certain space for the sky. This indicated that both five and six years old Czech students allocate typically 1/4th of the drawing paper for the sky. Table 2 also shows that, overall, 18 of 33 drawings were coded under category D. This revealed that

students' drew typically linear and curvy clouds on the sky. Only one student's drawing was included a range of mountains. Overall these findings indicated that Czech Students did not draw river that is originated from range of mountains. Figure 1 shows a student drawing that was coded under two categories: B, and C.

Figure 1. *Student Allocated Certain Space for the Sky and Drew Sun Typically Size of a Coin in the Sky*

In figure 1 student allocated a specific space for the sky (category C) Moreover, S/he located a coin size sun in the sky (category B) approximately size of a silver coin.

Figure 2 shows an example of students, which is coded under category B, and D but not coded under C.

Figure 2. *Student Drew Sun Typically Size of a Coin and Linear Curvy Clouds in the Sky*

In figure 2, although students drew sun and clouds in the sky, s/he did not allocated specific space for the sky in the drawings. This shows that not all drawings included all the described coded characteristics of this study.

Majority of the students' drawings did not coded under any of the categories. Figure 3 shows a student drawing that was not coded under any of the categories.

Figure 3. *An Exemplar Student Drawing that did not Coded under any Category*

This section examines the frequency and percentage distribution of students' drawings that did not coded under any of the categories. Across all 33 students' drawings, 100 % of the drawing did not include river originated from mountain, nearly 97 % of them (32 drawings) did not include a mountain range. Only approximately 24 % of the drawings (8 drawings) did not locate sun either middle of the sky or top right/left corner of the drawing paper, and nearly 52 % of them (17 drawings) did not coded under the category that described allocation of a certain space for sky. Finally nearly % 45 of the drawings (15 drawings) did not included linear and curvy clouds in the sky.

These results suggests that nearly half of the five and six year old students that were participated in this study drew some certain nature elements in their drawings: couple of linear and curvy clouds and allocated specific space for sky. Also, majority of the students (76 % of drawings) drew sun either in the middle of the sky or left or right corner of the sky. On the other hand, they did not draw, almost 100 %, certain nature elements: range of mountains in the back and a river rising from the mountains.

Discussion and Research Implications

This study indicated three major findings: First, unlike Turkish Students (Ulker, 2012), none of the Czech students drew a river that originates from the mountains. In addition, different from Turkish Students (Ulker , under review), only one Czech student's drawing was included a range of mountains. Similarly Turkish children's nature drawings

Czech children did draw some of the other nature items; a sun, and linearly arranged couple of clouds. One of the possible reasons for why younger children typically draw sun and clouds in their drawings is: students need to draw 3-D objects onto 2-D drawing paper. In addition some of the nature objects are difficult to draw and including complexity that requires spatial sense. According to Freudenthal spatial sense can be defined as the ability to 'grasp the external world' (National Council of Teachers of Mathematics [NCTM], 1989, p. 48). According to Nes and Lange (2007) this spatial sense consists of three main elements that will assist young children to 'grasp the world' and to develop mathematical thinking: spatial visualization and orientation, and geometry.

Piaget and Inhelder (1967) examined children drawings to gain insight about their development of spatial sense and geometry. They stated children first needed to identify different dimensions and to develop an understanding of projective and Euclidean relation (Piaget & Inhelder). As a result they can transfer observed 3-D objects onto 2-D paper. Since sun and clouds could be two of the least complex items in the nature for children to draw young children could be prefer to draw a coin size sun and linear curvy clouds. According to Piaget and Inhelder younger children started to discover topological relations but they did not recognize the Euclidean relations such as shape, location, proportion and area. Perception of Euclidean relations progressively developed, as children get older. Children started to recognize projective and Euclidean relations and this assisted them in drawing 3-D objects onto 2-D space with certain components and fidelity (Nussbaum & Novak, 2006; Piaget & Inhelder; Ulker, 2012). As a result, drawing only certain objects such as sun and clouds in similar manners may improve as children gets older because of improvement in children's spatial sense.

More nature drawing studies needs to be done with children of different countries to see if this type of drawing is universal in this certain way these nature items are organized on a drawing paper; Range of mountains in the

background, a sun, couple clouds, a river rising from mountains. Why Czech children did not typically draw range of mountains, a river rising from mountains? What is the effect of previous experiences, teachers' perception of nature on how children draw nature on a drawing paper? Do they have learning experiences with geometry activities in Kindergarten that help them to enhance spatial reasoning ability? If so, what are the activities that they involve so they can perceive nature in a different manner?

Conclusion

Drawings of nature are effective to reveal students' concepts of size, shape and location of nature items. The present study provides evidence of how Czech children of various age groups draw nature. As a final comment, this study clearly documented that, unlike Turkish children (Ulker, 2012), Czech children's nature drawings did not support the assumption of a universal type of children's nature drawings; Range of mountains in the background, a sun, couple clouds, a river rising from mountains.

On the basis of the results we can suggest some implications for environmental education:

- Many children have not got right idea about nature. There are missing some important parts of the nature, for example river, clouds, in some cases also sun. So the children could more visit nature. Teachers from kindergarten could organized more trips to near nature.

- If there is not possibility to visit nature, teachers from kindergarten could project movies about nature, where the protection of nature is presented.

- Also the task of parents is important, there is trend to leave children with computer or with television. Children are without connection with nature, so the parents could visit nature with children. Also they could visit botanical and zoological gardens. There are presented only suggestion, which could improve proenvironmental behavior of the children. We have to become aware, our children will create future world and without nature, the world will destroyed.

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