International Electronic Journal of Environmental Education (IEJEE-Green) is an international refereed academic journal which publishes research papers on all aspects of environmental education. The aim of the journal is to provide a thoughtful forum for environmental researchers, practitioners and scholars to further the study and practice of environmental and sustainability education.

International Electronic Journal of Environmental Education is published two issues per year. IEJEE-Green provides immediate open access to its content on the principle that making research freely available to the public to support a greater global exchange of knowledge.

IEJEE-Green is listed and indexed in: ERIC, Environment Complete (EBSCO), Directory of Open Access Journals (DOAJ), Index Copernicus, NewJour, Turk Egitim Indeksi, ASOS Index and Google Scholar.

INTERNATIONAL ELECTRONIC JOURNAL OF
ENVIRONMENTAL EDUCATION
Vol. 6, Issue 1, January 2016

ISSN: 2146-0329
www.iejeegreen.com

Table of Contents

International Electronic Journal of Environmental Education
Vol.6, Issue 1, 2016, 1-16
RESEARCH ARTICLE

Flying, Feathery and Beaked Objects: Children's Mental Models About Birds

Berat AHI*
Kastamonu University, Kastamonu, TURKEY

Received: October, 2015; Accepted: December 2015

To cite this article: Flying, feathery and beaked objects: Children's mental models about bird. *International Electronic Journal of Environmental Education, 6*(1), 1- 16,

Abstract

Purpose of this research is to state preschool students' mental model about birds by analyzing their drawing. This is a hermeneutical phenomenology research that is based on social constructivist philosophy. Typical case sampling method has used in order to form working group of this research. Working group consisting of 325 children who are in preschool education programs in Kastamonu Central District. Data gathered by draw and explain technique in this research. Firstly, children had asked to draw bird picture, then semi-constructed interview has made with children. By analyzing data gathered for this research, it is seen that significant amount of children drawn bird with outline drawing style (*f*=167, *%*=51.3). 181 children (*f*=181, *%*=55.6) drawn basic features of birds, and 83 children (*%*=25.5) drawn them as behavior shown. Majority of the children said that they see birds on outdoor environments (*f*=279, *%*=85.8), and also significant amount of children stated that the fundamental property of bird is their ability to fly (*f*=127, *%*=39.0). After analyzing these findings, it it seen that children have non-biological based, only physical property based modal and physical mental models about birds and their natural properties. Also, it was determined that children have developed their basic knowledge of birds in outdoor environments. In light of these results, necessity of including animal and habitat education with direct-learning methods in preschool curriculum and its necessity to apply this education in outdoor mediums with direct animal observations and experiences with them are underlined.

Keywords: Birds, draw and explain, mental model, child.

Introduction

Animals and humans are two species who have been in interaction from the beginning of the history. While time pass, humans have built this relationship in favor of their interest, and established dominance on animals. Serpell (2004) explains human's interest and their efforts on taming animals with three aspects: (a) their effects on humans, (b) their sympathetic appearance in human point of view and (c) their economical utility. In another opinion (Herzog & Burghardt, 1988), human's attitude on animals are affected by direct and indirect factors. According to Herzon and Burghardt (1988), direct effects are fear of animals which helped evolutional development of humanity, husbandry and distribution of animal population, while indirect effects are completely anthropomorphic generalizations and our perspective on their basic properties of animals, (for example: eyes, color, movements etc.) as we see them as "cute" things. Generally, humans are highly interested in animals if they find humanly properties on animals and also if they involve in frequent interactions.

In our daily life, it is obvious that we are not living with wide animal species (if we are not living in rural area or we are not working in animal related industries). Generally speaking, individuals are not involved any kind of interaction with animals in daily life, except cats, dogs, birds and some insect species. Many of us have only seen wild or

ISSN: 2146-0329
*E-mail: bahi@kastamonu.edu.tr

endemic animal species on TV shows, magazines or Internet (Prokop, Prokop, Tunnicliffe & Diran, 2007). Children, like adults, learn different animal species from the sources said above, additionally, they have interaction with animal shaped soft toys (Tunnicliffe, Gatt, Agius & Pizzuto, 2008). But Prokop et al. (2007) underlines that secondary sources of information like that cause misknowledge on biological concepts and mislearning on them. Animals like bird, cat, dog and fish surrounds our daily life, they even live in our home as pet. This causes that both children and adults have positive opinions on that animals. Nevertheless, experiences and the way we got them with that animals are also developing our attitude toward that animals. Serpell (2004) took birds as an example, and stated that because we can feed them by our hands with our food in same environment, we have more knowledge about birds than fish, and have more positive attitude towards them.

Unfortunately, it is very hard for both children and adults to observe biological and other environmental objects directly and getting knowledge from first hand resources (Evans, Gebbels, Stockill & Green, 2007). Louv (2010) defines this situation as lack of nature and states that this cause various negative effects on child. We obtain our knowledge on biological and ecological concepts way before we start school (Teixeria, 2000). In childhood, animals that can be seen in daily life and have cultural significance are known more (Tunnicliffe et. al., 2008). This is about child's first hand experiences; and in the learning process of biological concepts, childhood is more important than school education (Patrick & Tunnicliffe, 2011). Knowledge learned by this process defined as "naive biology" (Hatano and Inagaki, 1997). This kind of knowledge contains child's ability to make basic definitions related to biological objects and processes harmonically with biological environment (Inagaki and Hatano, 2006). However, this knowledge generally related to child's own experiences and it is not science based (Çardak, 2009). Vosniadou and Brewer (1994) remark that mental models about non science-based knowledge on scientific concepts are deficient and contains misconceptions.

Nowadays, learning defined as active and continuous process which depends on pre-existing knowledge and experience of individuals, and information is seen as the fundamental element of learning (Driver and Bell, 1986). Understanding and learning a consent or phenomenon means recalling related knowledge from memory and using it when it is necessary (White and Gunstone, 1992). Cognitive structures, that reflects symbol, object and relations from different schemas made from the human consciousness, affected from social-cultural life, projecting partial reality are called as mental models. (Gilbert, 2011). In early childhood, not only the education in school, but also the experiences from daily life are important on developing biological and environmental mental models (Prokop, et al., 2007). Child interprets happenings around her and develops mental models with behaviors (Greca and Moreira, 2000; Tunnicliffe, et al., 2008). However, it is not expected to develop metacognitional mental models by that way (Gilbert, 2005). Detection and structure of mental models have significant role on learning process because monads of the memory contain symbols reflecting knowledge instead of knowledge itself (Bruninng, Schraw and Norby, 2014). Because of this reason, it is important to detect children's mental models of concepts in the education. Children show their mental model constructed by understanding world by building models, bodily gestures and drawings (Hall, 2009).

Drawings are not only important to detect what child thinks in educational term, but also important to understand how she perceives her surroundings and makes sense of it (Brooks, 2009). Additionally, according to Piaget (1956) drawings are windows for tracking cognitive development. Vygotsky (1962) also stated drawings as an important tool for cognitive development and underlined that socio-cultural effects are also important as cognitive skills (Piaget, 1956). Hall (2009) highlights that drawings are

helpful tools for pre-school students for acquiring perception, communication, detection and action skills. Moreover, Chang (2012) underlines that in preschool science education, drawings provides data about child's learning on cognitive concepts and events and its extent, moderating configuration of knowledge, and its ability to provide active and entertaining learning process. According to Fello, Raquette and Jalongo (2006), especially in the childhood term, drawings have an important role on constructing science knowledge for developing mental models and also moderating learning process of scientific topics and shows understanding level on that topic. Cinici (2013) underlines that while the drawings are limited by child's information about scientific knowledge, they are important assessment tools to evaluate scientific knowledge level. Especially in recent years, using drawings in scientific knowledge and phenomenon in early childhood term researches becoming popular (Chang, 2012).

In the last years, biology and a general branch of it, ecology, is becoming important as a research field (Randler, 2009). Hatano and Inagaki (1997) states that biological understanding of children starts in early ages. Therefore, researches have made intended for children's knowledge and misconceptions about living world and animals which is a part of biology field. Especially, after Inagaki's research (1990) defining some of the factors influential on children's animal biology understanding become popular (Tunnicliffe, 2011). There are researches (Çardak, 2009a) to determine children's knowledge on animal's skeleton system (Prokop, et al., 2007; Tunnicliffe & Reiss, 1999), animals they see on daily basis (Tunnicliffe, et al., 2008), children's classification between vertebrate and invertebrate animals (Braund, 1998), their perception on hunting and hunt animals (Prokop & Kubiatko, 2008), defining relation between animal's appearances and fear of the animals (Kubiatko, 2012) and their insights on animals which they see as dangerous. In these researches, one of the most underlined and one of the most animal with lots of findings are birds.

After a literature scan, it it seen that underlying reasons for the reason of birds are the most researched animal species are those: Especially in early childhood, birds are more attractive than other species (Randler, 2009), their ability to involve in daily life and their strong properties separates them from other animals (Serpell, 2004). Prokop, Kubiatko and Fancovicova (2007) identified that primary school students can distinguish birds with their general properties, with the growing age their knowledge of birds are also increasing but their knowledge on bird's biological properties are not increasing. In another research of Prokop, Kubiatko and Fancovicova (2008), Slovakian students', whose age between 10-19, importance of observing and feeding birds in order to develop attitude and knowledge about them are underlined. Çardak (2009b) emphasized that college students have misconceptions about characteristics, behavioral properties of birds, human-bird interaction and biological classification of them. Randler (2009) underlines that in primary schools, education especially by using soft toys are effective for giving children ability identify and name bird species. Tunnicliffe (2011) states that English Children between age of 5-15 have enough knowledge about birds and their behaviors but in biological and physical aspects they have several misconceptions After combining all of these researches, there are opinions on lack of literature about children's knowledge on animals, and birds specifically (Prokop, Kubiatko and Fancovicova, 2008), and necessity to detect cultural differences and biological point of views of different age groups (Patrick & Tunnicliffe, 2011). This research has made in order to provide data on the said area and related literature and also to supply data on cultural aspects and different age groups. Additionally, lack of researches focused on preschool students is an important reason why this research is made. In this content, answers to questions below are seek in this research.

a) How is children's mental model on the bird species they interacted frequently in daily life.

b) In which way children draw and explain the concept "bird".

Methodology

Aim of this research is to determine children's mental models about birds, this is a social constructivist philosophy based hermeneutical phenomenology research. Social constructivist philosophy advocates that individuals build their opinions and angle of views from their daily experiences by analyzing and processing them with their knowledge process and create new opinions, concepts and phenomenon (Creswell, 2007). Phenomenological researches are the ones that trying to understand individuals' experiences on a concept or phenomenon (Crewell, 2007). General purpose in this researches is to gather data from participants' experiences (Fraenkell & Wallen, 2008). Phenomenological researches are named as hermeneutical phenomenology researches if they interpreted from writings or drawings (Creswell, 2007). In this research, data gathered from children's drawings and their explanations made by them, so it is designed as hermeneutical phenomenology research.

Working Group

Working group of the research is consisting of preschool students from preschools and primary schools in South-West of Turkey, Kastamonu City, Central District. Typical case sampling method has been used to form working group of this research. Purpose of this technique is to form working group from average and 'normal' participants that are accessible within population (Yıldırım & Şimşek, 2008; Creswell, 2007). Within the purpose of this research, to identify preschool students' mental model on birds, which are one of the animals seen on a daily basis, children have selected from schools with typical situations. Information about working group has shown in Table 1.

Table 1.

Demographic characteristics of the children in the working group

Sex	***Girl***		***Boy***		***Total***	
	f	%	*f*	%	*f*	%
Age 4	84	25.8	61	18.8	145	44.6
Age 5	99	30.5	81	24.9	180	55.4
Total	183	56.3	142	43.7	325	100.0

Gathering Data

Data of this research gathered from children's bird drawings and interviews made about that drawings. Data gathered by draw and explain technique in this research. Draw and explain is a technique which is used widely in literature and one of the most effective one to gather data from preschool students (Liu & Lin, 2015; Moseley, Desjean-Perrotta & Utley, 2010; Shepardson, Wee, Priddy & Harbor, 2007).

Data gathered from students of preschools and preschool students from primary schools in Kastamonu City Central District in fall term of 2015-2016 education year. Researcher had met with supervisor and preschool teacher in order to determine and organize schedule for gathering data and to have necessary permits. Data gathered in school at scheduled time and date. While papers have provided by researchers,

students used their own pencils in data gathering process. Half of an A4 paper has given to children and they are asked to draw a bird picture. In order to prevent children

from communicating each other, they separated into groups of three and researcher tried to stop their communication with each other as much as possible. Interviews after drawing phase have made in another room inside school. For children who didn't want to stay alone with researcher, a familiar school worker included in the meeting room to calm down the children. Semi-structured interview questions asked to child about the picture she drawn. While the drawings have been made collective, meetings have made individually. Drawings took around 25 minutes, and interviews took 15 minutes for each child. Protocol for gathering data is shown in Table 2.

Table 2.

Data acquisition protocol

Data Acquisition Protocol
Drawing Bird Picture 1- The child is asked to draw what comes to his/her mind when thinking of bird.
Verbal Explanation 1- Can you describe the bird you drawn in the picture? What are these birds doing? 2- Where do you see birds in your daily life? 3- What is the most significant property of a bird for you?

Analyzing Data

In the research, phenomenological analyze process which is suggested by Creswell (2007) carried out. This process consist of six steps. Firstly, experiences of participants about the studied concept should be determined. For this purpose, children have interviewed about their drawings and asked to tell if they have any story including birds. In second step, important situations are decided. In the scope of the research, children have interviewed about their memories and current knowledge about birds and important points tried to be detected. In the third step, important points gathered together. In research, answers of children gathered in bigger groups in different contents. While fourth step is to detect "what" participant experienced, fifth step is to identify how it experienced. With the questions asked in interview, effects of phenomenological experiences on mental model tried to understand. Lastly, in the sixth step, data gathered from other five steps are interpreted and adjudicated. Within the scope of the research, basic properties of birds included in drawings have compared with the results of the interviews and the overall findings were reached.

Researches not only classified some properties of birds drawn (for example: color selection, physical properties of bird, drawing style etc.) but also classified data gathered from interviews. After the researcher finished classification, data sent to an expert on biological and environmental education and he is asked to analyze the data. Kappa Measure of Agreement value has calculated for classification of both researcher and the expert. The kappa value calculated as .81. According to this result, it can be said that there is high compliance between two lists (Pallant, 2011).

Findings

Data of the research is consisting of drawings and opinions on them. In the research, firstly, results gathered from the drawings shared, then fundamental properties of drawings provided. After, findings from interviews are provided.

Table 3.

General properties from children's drawings

Feature in Drawing	*Age 4*		*Age 5*		*Total*	
	f	*%*	*f*	*%*	*f*	*%*
Drawing black and white	67	75.3	22	24.7	89	100.0
Drawing in color	78	33.1	158	66.9	236	100.0
List drawing	22	91.4	2	8.6	24	100.0
Exhibit drawing	17	37.0	29	63.0	46	100.0
Symbolic representation	34	38.6	54	61.4	88	100.0
Outline	72	43.1	95	56.9	167	100.0
Basic features (eg. Beak, legs, body, wings)	79	43.6	102	56.4	181	100.0
Behavior shown (eg. Walking, flying)	18	21.7	65	78.3	83	100.0
One plus drawn	0	0.0	1	100.0	1	100.0
No bird	1	50.0	1	50.0	2	100.0
Other type of bird (e.g. duck)	1	100.0	0	0.0	1	100.0
Basic features can not determined	46	80.7	11	19.3	57	100.0

Representing Bird (Drawings)

Drawings of children within working group evaluated in color usage, drawings style of bird figure and basic properties of drawings. All of these data is shown in Table 3.

By analyzing Table 3, it is seen that majority of children (*f*=167, *%*51.4) drawn birds as outline. Accordingly, children drawn bird figure with showing outline. In addition, some of the children (*f*=88, *%*27.1) drawn bird as a symbol. "V" and "M" are mostly used as symbols. Another significant result of the research is that only a small part of children (*f*=46, *%*14.2) made exhibit-type drawing. According to that, birds in pictures have drawn interacting with other objects and organisms. In drawings, trees used as mostly as organism interacting with birds. Sun and grass drawings also seen in these kind of drawings. Examples of children's drawings shown in Figure 1.

Picture explanation: Symbolic representation. Symbol used: "M". Colorful Drawing

Picture explanation: Exhibit style drawing. Colorful Drawing Behaviour Shown: Flying

Figure 1. Examples of children's drawings

Children from working group of this research generally drawn bird figure to show basic features of it (*f*=181, *%*55.7). Some of the children drawn bird while they show behavior (*f*=83, *%*25.5). There are different birds behavior in drawings. Table 4 shows this distribution.

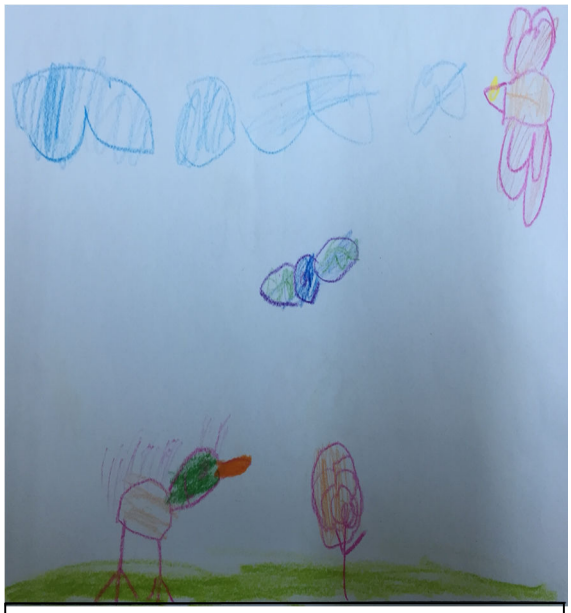
Table 4.

Bird behaviors seen on children's drawings

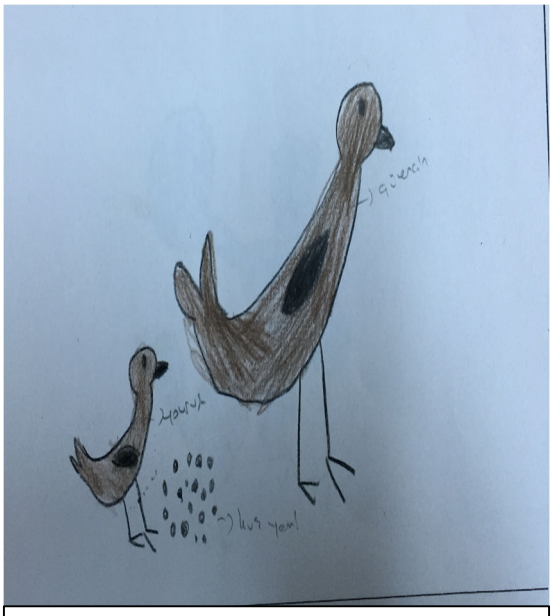
Behaviours Illustrated	***Age 4***		***Age 5***		***Total***	
	f	*%*	*f*	*%*	*f*	*%*
Feeding	2	50.0	2	50.0	4	100.0
Flying	9	14.5	53	85.5	62	100.0
Sitting in tree	0	0.0	4	100.0	4	100.0
Flocks fly	2	40.0	3	60.0	5	100.0
Walking on ground	5	62.5	3	37.5	8	100.0
Total	18	21.7	65	78.3	83	100.0

According to Table 4, drawings of working group that shows behavior of bird show it flying (*f*=62, *%*74.7). Accordingly, it can be said that children adopt flying as the most typical behavior of bird. C26 '*(...) because it is a bird. Flying in the air is its property';* C37 *'I think flying is what separates birds from other animals';* C186 *'Birds fly to go somewhere. That is why they are birds.*' One of the most significant results is birds have drawn while they are feeding themselves. While small amount of children drawn birds while they are feeding themselves (*f*=4, *%*4.8), in their age range, it is believed that this result is important about food chain knowledge. From children, C249 *'Birds eat*

worms (...)'; C11 *'These are bagels, birds can eat bagels on the floor'* we see their opinion on birds feeding behavior. Another significant result is that 5 years old children draw more behaving birds than 4 years old ones. Children's drawings about bird behaviors shown in Figure 2.



Picture explanation: Walking on the ground. Outline drawing



Picture explanation, Feeding mother and fledgling

Figure 2. Bird behaviors seen on children's drawings

Representing Bird (Interview)

As a result of the interviews, findings on where the children see birds mostly and what are the most remarkable properties of birds found. From this findings, implications on formation of mental models about bird concept can be interpreted. Table 5 shows answers of children when they asked the place they see birds.

Table 5.

Where children see birds frequently

Where They See Bird	***Age 4***		***Age 5***		***Total***	
	f	*%*	*f*	*%*	*f*	*%*
House	28	63.6	16	36.4	44	100.0
Outdoor	16	41.6	163	58.4	279	100.0
TV	1	50.0	1	50.0	2	100.0
Total	44	13.5	279	85.8	325	100.0

As seen in Table 5, majority of children (*f*=279, *%*85.8) see birds outdoor, as expected. Between outdoor mediums, rural area expressed mostly (*f*= 183, *%*56.3). In outdoor mediums, it is remarkable that mosque has specified by 40 children (%12.3). There is an ancient mosque in the centrum of Kastamonu City, where this research made, and people feeding birds in its garden Because of this Nasrullah Mosque identified with birds. (Picture 1) Kastamonu is a small city, and people are generally walk around Nasrullah Mosque. This situation is also valid for children. Some of the children in interview made this statement C57 *'I saw at Nasrullah Mosque. 'My father's workplace is near. I always see birds at there. I love them.',* C309 *'I see at the central mosque (meaning Nasrullah Mosque). They are always there. I also feed them.'* and C193 *'I feed them around Nasrullah Mosque. There are lots of them at there. It makes me afraid when they fly. But I love them.'* This is seen as evidence to effect of social environment for building mental model and stands out as an important finding. 44 children from working group said that they pet birds at home (*%*13.5). Only one child stated they he saw bird on TV.

Picture 1. Nasrullah Square (06.11.2015)

Children asked to identify bird's most remarkable property in interviews. Thus, children's perspective on separating birds from other animals tried to be detected. Findings on this are shown in Table 6.

Table 6.

Remarkable Bird Properties According to Children

Most remarkable Property of Bird	*Age 4*		*Age 5*		*Total*	
	f	*%*	*f*	*%*	*f*	*%*
Foot	9	42.9	12	57.1	21	100.0
Beak	23	41.1	33	58.9	56	100.0
Eye	3	33.3	6	66.7	9	100.0
Wing	16	34.8	30	65.2	46	100.0
Color	5	25.0	15	75.0	20	100.0
Sound	3	60.0	2	40.0	5	100.0
Feather	15	57.7	11	42.3	26	100.0
Ability to fly	64	50.4	63	49.6	127	100.0
Reproductively	3	50.0	3	50.0	6	100.0
Nest	4	44.4	5	55.6	9	100.0

When findings on Table 6 reviewed, it is seen that majority of the children underlined physical properties of birds. Children mostly find bird's ability to fly remarkably. Significant amount of children from working group named bird's ability to fly as the most remarkable property (*f*= 127, *%*39.1). Accordingly, some opinions are those: C273 '*I mostly like their ability to fly I thing flying is a beautiful thing.',* C118 *'The first thing I think about birds is their ability to fly. For me, best property is to fly.'* After ability to fly, beaks of birds have underlined mostly. 56 children stated beaks as the most remarkable part (*%*17.2). Most striking findings about children's view on beak is that they compare beak with human mouth and they find beak different and interesting. Also, they find birds feeding with their beaks interesting. A five years old child *'Birds' beaks are funny. Its tip is sharp, not like us. (...) I think their mouths are beautiful. By this way, they can eat worms. If they had mouths like us, they can not eat from ground.'* are most common comments. Similar opinions have told by other children too. According to these findings, children's ability to make teleological explanations about bird beak and their ability to differentiate human mouth from bird beak detected.

Additionally, some children stated wings as a remarkable property of bird (*f*= 46, *%*14.2). They develop special point of view on wings because they see it as a special flying organ. A four-year-old child, C271 *'Most remarkable property of bird is wings. They can not fly without wings. That is why wings are important for them.'* 26 children from working group (*%*8.0) finds birds' feathers remarkable. Generally, it is believed that feathers are keeping birds warm. C79 *'Feathers protect birds from cold. Without feathers, they can not survive on streets.'* are most common comments. 21 children said that birds' feet are very different and it is their significant property. Some of the children can explain different feet of birds teleologically. Five years old C318 *'If birds' feet were not the way they are, they can not hold on tree branches. They would fall.'* and four years old C103 'If their feet were not thin as they are, they could not hold on electric cables. *They have 3 fingers in their foot and they wrap cable.'* are most common comments. According to these, event it is limited, it is seen that children have ability to explain structural properties and duties of organs. Another interesting finding on Table 6 is that six children (*%*1.8) explained their opinion about reproductivity of birds. C9 *'I like that birds laying eggs. How they put it out? I think it is weird.'* is the comment.

Results and Discusiion

This research aims to define children's mental model on one of the animal species, birds by analyzing their drawings. Different experiences or parts can be detected from drawings (Hall, 2009). This research has studied children's drawings from different aspects and variables. Accordingly, most of the children made colorful drawings (*f*=236). While 78 (*%*33.1) of the children who drawn colorful are four years old, remaining 158 (*%*66.9) children are five years old. In his research, Tunnicliffe (2011) also found that children with higher age are using more colors in their drawings. Result of this research is coinciding with Tunnicliffe's (2011) research.

When analyzing children's bird drawing style, it is seen that majority (*f*=167) of them draw main lines of bird, then leave inside empty to make outline drawing. 88 of children used symbols for drawing bird, mostly used symbols are 'V' and 'M'. In Tunnicliffe's (2011) research, there were also children that draw symbol instead of birds, and English children frequently used 'V' symbol too. Considering similar results of both researches, finding similar symbols for same concept (bird) is supporting universal dimensions on genetic epistemology knowledge gathering and showing it (Piaget, 1970). 46 children from working group draw picture as exhibit style drawing, interacting with different objects. These objects are schemas related mental models. Most frequently used codes are tree, sun and grass. Children's ability to draw detailed pictures about birds can be result of their knowledge on birds which is more than any other animal (Bowker, 2007). Mental models are consisting of more than one schemas and there are relations between these schemas (Seal, 2006). Similar schemas in bird drawings have detected in Tunnicliffe's (2011) research. Drawings are important tools for detecting schemas that children have (Fello, Raquette & Jalango, 2006).

When analyzing drawing styles generally, having more outline drawing style and less exhibit style is not a surprise. There are lots of factors that effect quality and content of the drawings. Child's linear development may cause limitations on ability to transfer knowledge to work (White & Gunstone, 1992). This can never have interpreted as cognitive deficiency. Anning and Ring (2004) defend similar view on this topic, underlines linear development on drawing quality. Hall (2009) defends that by using drawings, children perceive surrounding figures and actions better, and experience gathered by aging increases details on drawings. According to these, having more exhibit style drawings from five years old children verifies this opinion.

Braund (1998) states that drawing styles and sizes of animal figures in pictures are important variables that children (especially in younger age group) use in defining animals. In animal drawings, birds are pictured way better than other animals (Tunnicliffe & Reiss, 1999). 188 children from working group (*%*57.8) drawn bird with basic anatomic features like two feet, two wings and beak. This result coinciding with Tunnicliffe's (2011) research. Çardak (2009) and Prokop, Kubiatko and Fancovicova (2007) also specify children's ability to say physical properties of birds better. Knowledge on a concept generally coded from its distinctive visible properties and early schemas of mental models generally belongs to these properties (Bruning, Schraw & Norby, 2014). Similarly, Inagaki and Hatano (2006) says in early mental models about biological concepts, this basic features and mental process on this concept are significant. Although this kind of process may help developing misconceptions (Çardak, 2009; Prokop, Kubiatko and Fancovicova, 2008), it is important because these are first structures on mental models. From this results, it can be said that more than half of children from working group (*f*=188, *%*57.8) developed basic anatomical features related to birds inside their mental models.

Children obtain living-world knowledge from real and visual experiences (Tunnicliffe, 2011). These experiences are very important to understand any concept (White &

Gunstone, 1992). In this research, majority of children (*f*=279, *%*85.8) remarked they mostly see birds in outside mediums. Cinici (2013) underlines importance of observation in development of children's basic knowledge about livings. Prokop et al. (2007) also states that child's experience about animals are based on direct observations in nature.

Vygotsky (1971) specifies learning process as a part of social environment and every information created have traces from cultural, historical or sociological background. Mental models also include these factors as Vygotsky (1971) states and affected from them (Franco and Colinvaux, 2000). Also, Young (2008) underlines the effect of living area on mental model development. According to all of these, 40 children's (*%*1.2) understanding of combining Nasrullah Mosque with bird concept can be accepted clearly. It is an expected result that an area where humans and birds interact frequently took place in children's minds and being identical, since children are also individuals who live in Kastamonu. This is a salient result in a way it shows mental model development and lifestyle's effect on it.

Another important result of this research is that 44 children petting bird house environment and highlighting their experience in house medium. According to Tunnicliffe et al. (2008), house is an important environment for gathering information and experiences. Prokop, Kubiatko and Fancovicova (2007) underlines that children who pet and observe birds in house environment have better and more knowledge about them. This can be explained with frequent and personal experiences of child with bird and this frequent relation is important to define basic features of animals (Prokop, et al., 2007). While some researches remarks TV, internet and other media mediums effective for learning and seeing animals (Prokop et al., 2007; Tunnicliffe & Reiss, 1999; Tunnicliffe, et al., 2008), only two children from this research (%0.8) said that they saw bird in TV. According to Çardak (2009), as a result of children's living area shift from natural areas to interiors, magazine, book, TV and internet are new mediums they are getting knowledge about animal's physical properties and this cause misconception.

Prokop et al. (2007) states that children can keep animal's remarkable properties in their minds easily. Besides, as Prokop, Kubiatko and Fancovicova (2007) state, it is way easier to categorize from their basic properties in childhood term. Significant amount of children from working group named birds ability to fly as the most remarkable property (*f*=127, *%*39.1). 56 children (%17.2) beak and 46 children (*%*14.1) find wings remarkable. One of the most important finding is six children's opinion as finding reproductivity (egg) remarkable (%1.8). Additionally, feather (*f*=26, *%*8.0), foot (*f*=21, *%*6.4), nest (*f*=9, *%*2.7) and sound (*f*=5, *%*1.5) particularly underlined. Final results coinciding with Tunnicliffe's (2011) research. Similarly, both research found bird's basic anatomical features like wing, beak, foot as most remarkable properties. Tunnicliffe (2011) also states reproductivity (egg) highlighting. In this research, children underline nourishment while they talk about beak and eye properties. This is also an important result. Current preschool curriculum in Turkey (MEB, 2016) does not include enough emphasis on food chain concept. Even so, children's emphasis on bird's nourishment properties is remarkable. Also, as Prokop, Kubiatko and Fancovicova (2007) state, it is way easier to categorize from their basic properties in childhood term.

From the results of this research, even children's mental model about birds does not have biological basis, it is sufficient in figurative and basic property basis, and adequate for their age. Additionally, it is detected that children see birds generally at outdoor environments. From these results, it is determined that there must be more effort to teach children about biological knowledge of animals. In the curriculum run in Turkey preschool education system, (MEB, 2016) there is not any direct topic towards animals, only Recovery 10 as *'animals living around us'* specified in social-emotional

development. Additionally, 4 October Animal Protection Day included in specific days and weeks as need to be addressed. Researcher thinks that these are not enough themselves. That is why direct acquisition in order to develop biological knowledge about animals, and also for protecting, loving etc. should be included in preschool education curriculum. From the findings, as children mostly observe animals outdoor, science and nature events that have direct contact with animals, and drama educations should be planned and included natural environment with different materials (book, magazine, internet etc.).

. . .

References

Anning, A. & Ring, K. (2004). *Making sense of children's drawings.* Berkshire: Open University.

Bowker, R. (2007). Children's perceptions and learning about tropical rainforests: An analysis of their drawings. *Environmental Education Research, 13*(1), 75-96.

Braund, M. (1998). Trends in children's concepts of vertebrate and invertebrate. *Journal of Biological Education, 32*(2), 112-118.

Brooks, M. (2009). Drawings, visualisation and young children's exploration of "big ideas". *International Journal of Science Education, 31*(3), 319-341.

Bruning, R. H., Schraw, G. J. & Norby, M. M. (2014). *Bilişsel psikoloji ve öğretim.* (Z. N. Ersözlü ve R. Ülker, Çev.). Ankara: Nobel.

Chang, N. (2006). What are roles that children's drawings play in inquiry of science concepts? *Early Child Development and Care, 182*(5), 621-637.

Chang, N. (2012). The role of drawing in young children's construction of science concepts. *Early Childhood Education Journal, 2012*(40), 187-193.

Cinici, A. (2013). From caterpillar to butterfly: A window for looking into students' ideas about life cycle and life forms of insects. *Journal of Biological Education, 47*(2), 84-95.

Creswell, J. W. (2007). *Qualitative inquiry & research design.* (Second Edition). London: SAGE.

Çardak, O. (2009a). Students' ideas about dangerous animals. *Asia-Pacific on Science Learning and Teaching, 10*(2), 1-15.

Çardak, O. (2009b). Science students' misconceptions about birds. *Scientific Research and Essay, 4*(12), 1518-1522.

Driver, R., & Bell, B. F. (1986). Students' thinking and the learning of science: A constructive view. *School Science Review, 67,* 443-456.

Evans, S., Garside, C., Gebbels, S., Stockill, J., & Green, M. (2007). The citienzs' day: Encouraging young people to acquire, value and use environmental knowledge. *School Sci. Rev. 88*(325), 45-50.

Fello, S. E., Racquette, K. R. & Jalongo, M. R. (2006). Talking drawings: Intermediate students' comprehension of expository science text. *Childhood Education, 83*(2), 80-86.

Fraenkel, J. R. & Wallen, N. E. (2008). *How to design and evaluate research in education.* (Seventh Edition). Boston: McGraw-Hill.

Franco, C. ve Colinvaux, D. (2000). Grasping mental models. J. K. Gilbert ve C. J. Boulter (Eds.), in *Developing models in science education,* (pp.93-118). Dordrecht: Kluwer Academic Publishers.

Gilbert, J. K: (2005). *Visualisation in science education.* Dordrecht: Springer.

Gilbert, S. (2011). *Models- based science teaching: Understanding and using mental models.* Virginia: NSTA Press. 16.02.2015 tarihinde http://site.ebrary.com/lib/kastamonu/reader.action?docID=10567536 sayfasından erişilmiştir.

Greca, I., M. & Moreira, M. A. (2000). Mental models, conceptual models, and modelling. *International Journal of Science Education, 22*(1), 1-11.

Hall, E. (2009). Mixed messages: The role and value of drawing in early education.

Hatano, G. & Inagaki, K. (1997). Qualitative changes in intuitive biology. *European Journal of Psychology of Education, 12*(2), 111-130.

Herzog, H. & Burghardt, G. M. (1988). Attitudes towards animals: Origins and diversity. *Anthrozoös,* 1: 214-222.

Inagaki, K. (1990). The effects on raising animals on children's biological knowledge. *British Journal of Developmental Psychology, 8*(1), 119-129.

Inagaki, K. & Hatano, G. (2006). Young children's conception of the biological world. *Current Direction in Psychological Science, 15*(4), 177-181.

Kubiatko, M. (2012). Kindergarten children's perception of animals focusing on the look and fear of animals. *Educational Science: Theory & Practice, Special Issue,* 3181-3186.

Liu, S. C., & Lin, H. (2015). Exploring undergraduate students' mental models of the environment: Are they related to environmental affect and behavior? *The Journal of Environmental Education, 46*(1), 23-40.

Louv, R. (2010). *Doğadaki son çocuk.* (Çev. C. Temürcü). Ankara: TÜBİTAK. (Original Title: Last child in the wood)

Milli Eğitim Bakanlığı. (2016). *Okul öncesi eğitim programı.* Ankara.

Moseley, C, Desjean-Perrotta, B. & Utley, J. (2010). The draw an environment test rubric (DAET-R): Exploring pre-service teachers' mental models of the environment. *Environmental Education Research, 16*(2), 189-208.

Pallant, J. (2011). *SPSS survival manual.* Australia: Allen & Unwin.

Patrick, P. & Tunnicliffe, S. D. (2011). What plants and animals do early childhood and primary students name? Where do they see them? *The Journal of Science Education and Technology, 2011*(20), 630-642.

Piaget, J. (1956). *The child's conception of space.* New York: Macmillian.

Piaget, J. (1970). *Genetic epistemology.* New York: The Norton Library.

Prokop, P., Kubiatko, M. & Fancovicova, J. (2007). Why do cocks crow? Children's concepts about birds. *Research in Science Education, 2007*(37), 393-405.

Prokop, P., Kubiatko, M. & Fancovicova, J. (2008). Slovakian pupils' knowledge of, and attitudes toward, birds. *Anthrozoös, 21*(3), 221-235.

Prokop, P., Prokop, M., Tunnicliffe, S. D., & Diran, C. (2007). Children's ideas of animals' internal structures. *Journal of Biological Education, 41*(2), 62-67.

Randler, C. (2009). Learning about bird species on the primary level. *Journal of Scientific Educational Technology, 2009*(18), 138-145.

Seel, N. M. (2006). Mental models in learning situation. C. Held, M. Knauff ve G. Vosgerau (Eds.), *Mental models and the mind. Current developments in cognitive psychology, neuroscience, and philosophy of mind* (1st ed.). (pp. 27-51). Amsterdam: Elsevier.

Serpell, J. A. (2004). Factors influencing human attitudes to animals and their welfare. *Anthrozoös,* 13: 145-151.

Shepardson, D. P., Wee, B., Priddy, M. & Harbor, J. (2007). Students' mental models of the environment. *Journal of Research in Science Teaching, 44*(2), 327-348.

Teixeira, F. (2000). What happens to the food we eat? Children's conceptions of the structure and function of the digestive system. *International Journal of Science Education, 22,* 507-520.

Tunnicliffe, S. D. (2011). Visualisation of animals by children: How do they see birds? *CEPS Journal, 1*(4), 63-80.

Tunnicliffe, S. D. & Reiss, M. J. (1999). Students' understandings about animal skeletons. *International Journal of Science Education, 21*(11), 1187-1200.

Tunnicliffe, S. D., Gatt, S., Agius, C., & Pizzuto, S. A. (2008). Animals in the lives of young Maltese children. *Eurasia Journal of Mathematics, Science & Technology, 4*(3), 215-221.

Vosniadou, S. ve Brewer, W. F. (1994). Mental models of the day/night cycle. *Cognitive Science, 18,* 123-183.

Vygotsky, L. S. (1962). *Thought and language.* Cambridge, MA: MIT.

Vygotsky, L. S. (1971). *The psychology of art.* Cambridge: The MIT.

White, R. & Gunstone, R. (1992). *Probing understanding.* London: The Falmer.

Yıldırım, A. & Şimşek, H. (2008). *Sosyal bilimlerde nitel araştırma yöntemleri.* (Altıncı Baskı). Ankara: Seçkin.

Young, I. (2008). *Mental Models: Aligning design strategy with human behavior.* New York: Rosenfeld.

International Electronic Journal of Environmental Education
Vol.6, Issue 1, 2016, 1-16
RESEARCH ARTICLE

Uçan, Tüylü ve Gagalı Şeyler: Çocukların Kuş Hakkındaki Zihinsel Modelleri

Berat AHİ
Kastamonu Üniversitesi, Kastamonu, TÜRKİYE

Alındı: Ekim, 2015; Kabul Edildi: Aralık, 2015

Özet

Bu araştırmanın amacı okul öncesi eğitim alan çocukların kuş hakkındaki zihinsel modellerini çizimler aracılığıyla belirlemektir. Araştırma sosyal yapısalcı felsefe temelinde yürütülen bir heuristik fenomenoloji araştırmasıdır. Araştırma için çalışma grubunun oluşturulmasında tipik durum örnekleme tekniği kullanılmıştır. Araştırmanın çalışma grubunu Kastamonu İl'i Merkez İlçe'sinde okul öncesi eğitim alan 325 çocuk oluşturmaktadır. Araştırma kapsamında veriler çiz ve açıkla tekniği kullanılarak toplanmıştır. Çocuklardan öncelikle bir kuş resmi çizmeleri istenmiş, sonrasında çizimleri üzerinden yarı-yapılandırılmış görüşme yapılmıştır. Çalışma grubundan elde edilen veriler incelendiğinde çocukların önemli bir bölümünün (*f*=167, *%*=51.3) kuşu ana hatları çizilmiş tarzda çizdikleri belirlenmiştir. 181 çocuk (*f*=181, *%*=55.6) kuşa ait temel özellikleri çizmiş, 83 çocuk (*%*=25.5) kuşu davranış gösterirken şeklinde çizmiştir. Çocukların çok büyük bir bölümü (*f*=279, *%*=85.8) kuşu açık hava mekanlarda gördüğünü belirtmiş ve yine çok sayıda çocuk (*f*=127, *%*=39.0) kuşa ait en temel özelliğin uçmak olduğunu belirtmiştir. Elde edilen bulgular dikkate alındığında çocukların kuşlar hakkında biyolojik temelli olmayan ancak, temel fiziksel ve şekilsel özelliklere sahip zihinsel modellere sahip oldukları sonucuna ulaşılmıştır. Ayrıca çocukların kuş kavramına ait temel bilgileri açık hava mekanlardan edindikleri de belirlenmiştir. Bu sonuçlar ışığında Türkiye'deki okul öncesi eğitim programında hayvanlara yönelik doğrudan kazanımlara yer verilmesi gerektiği ve verilecek eğitimin mümkün oldukça açık hava mekanlarda, hayvanları doğrudan gözlemlemeye ve doğrudan deneyimlemeye izin verecek şekilde tasarlanmasının önemli olduğu vurgulanmaktadır.

Anahtar Kelimeler: Kuş, çiz ve anlat, zihinsel model. çocuk.

ISSN: 2146-0329
*E-mail: bahi@kastamonu.edu.tr

International Electronic Journal of Environmental Education
Vol.6, Issue 1, 2016, 17-28
RESEARCH ARTICLE

Predictors of Behavior Factors of High School Students Against Recycling

Osman CIMEN*
Gazi University, Ankara, TURKEY

Mehmet YILMAZ
Gazi University, Ankara, TURKEY

Received: July 2015; Accepted: December, 2015

To cite this article: Predictors of behaviour factors of high school students against recyling. *International Electronic Journal of Environmental Education, 6*(1), 17- 28,

Abstract

This study aims to determine the variables that predict high school students' recycling behaviors. The study was designed as survey model. The study's sample consists of 203 students at a high school in Ankara. A recycling behavior scale developed by the researchers was used as a data collection tool. The scale has 3 dimensions: recycling behavior, recycling interest and recycling preferences. The reliability coefficient of the scale was determined to be .90. The data were analyzed using Pearson's correlation and multiple regression with the SPSS 18 package program. A significant correlation was found between high school students' recycling behaviors and variables such as environment anxiety, recycling knowledge and environmental student club membership. Also, as a variable, recycling knowledge was found to be a significant predictor of recycling behavior in general and its behavior and preferences dimensions. Recommendations are offered based on these results.

Keywords: Recycling, recycling behavior, recycling knowledge, environment clubs.

Introduction

Animals and humans are two species who have been in interaction from the beginning Today, one of the most important environmental problems is solid wastes. Excessive solid waste production has become a crucial issues for countries. The resolution of waste problems is among their priorities (Vicente & Reis, 2007). It has local, national and international levels. On the one hand, there are technological innovations, on the other hand there are decision mechanisms about human behaviors and recycling (Davies, Foxall & Pallister, 2002). Solid wastes are produced as a result of social, domestic and industrial activities. As a result of population increases and technological developments, the amount and variety of solid wastes has also increased. Solid wastes remain in nature without deteriorating for a long time, cause environmental pollution and affect human health negatively (Kayranlı, Tankut &Pampal, 2003). The most important ways of reducing waste production and resource consumption are recycling and reusing. Wastes from production and consumption can be reused. High quality raw materials or by-products can be obtained, reused, and energy can be obtained (Meriç & Kayranlı, 2003).

Recycling is the inclusion of waste that can be reused in the production process again by putting them through a variety of physical and/or chemical processes and transforming it into secondary raw materials. Thanks to recycling, waste products, the negative effects of waste materials on environment, health and economy are lessened, and the destruction of natural resources is prevented (Spiegelman & Sheehan, 2004). Recycling is one of the most frequently measured dimensions of environmentally

ISSN: 2146-0329
*Corresponding Author: Osman Cimen
E-mail: osman.cimen@gmail.com

sensitive behaviors since recycling makes important contributions to economy and environment (Iyer & Kashyap, 2007; Valle, Rebelo, Reis & Menezes, 2005).

Environmental problems cannot be solved with only technology or laws. This is possible only with changes in individual behavior. Changing behavior requires changes in attitudes, knowledge and moral values. The adoption of positive attitudes and moral values for the environment is only possible with environmental education (Erten, 2002). Miranda and Blanco (2010) emphasized that environmental awareness is one of the most important factors that affect recycling. Environmental education and structural amenities encourage recycling. The purpose of environmental education is to raise the awareness of young individuals about environmental issues (Byerne & Regan, 2014).

Studies have been conducted on factors such as the available infrastructure for recycling, recycling programs, awareness about the results of recycling, environmental knowledge and interest, settlement locations and types, perceived social effect and attitudes towards recycling (Davies et al., 2002; Barr et al., 2001; Tonglet et al., 2004). Correlations between recycling and a variety of variables have been examined in studies about recycling. The fact that there is a correlation between the socioeconomic levels of individuals and their recycling behaviors has also been noted by studies (Oskamp et al., 1991). Vining and Embro (1990) stated that attitudes towards special fields such as recycling can affect general behaviors. Easy access to recycling bins is the most important factor that affects recycling behavior and attitudes towards recycling (Ebreo & Vining, 2000; Schultz, Oskamp & Mainieri 1995; Schultz, Oskamp & Maineri, 1996; Hansmann et al., 2006).

Ebreo and Vining (2001) conducted their study to examine how the self-regulation behaviors of individuals affect their recycling behaviors. Tonglet, Philips and Read (2004) examined the predictors of recycling behavior according to the theory of planned behavior in their study. Corral Verdugo et al. (2003) investigated the effect of individual and situational factors on recycling behaviors. Nigbur, Lyons and Uzzell (2010) examined the effect of attitudes, norms, personal characteristics and environmentally sensitive behaviors on recycling according to the theory of planned behavior.

The environmentally sensitive behaviors of students are shaped by environmental education in schools. Considering the fact that recycling is an important component of environmentally sensitive behaviors, the determination of predictors of students' recycling behaviors is crucial.

Thus, this study aims to examine the variables that predict high school students' recycling behaviors. These are its research questions in the light of this general aim:

a) Is there any significant correlation between the recycling behaviors of high school students and variables such as gender, grade, environmental club membership and environmental knowledge?

b) Do the variables in the study predict the recycling behavior of high school students?

c) Do the variables in the study predict the recycling behavior, recycling preferences and recycling interest dimensions?

Methodology

Research Model

A survey model was used in this study. A survey model is a research approach that aims to describe, represent and explain a case such as events, groups, objects and characteristics in the past or today by using different variables and generating data about them (Büyüköztürk, Çakmak, Akgün, Karadeniz & Demirel, 2008;).

Participants

Research participants consisted of 203 students attending two high schools in Ankara. Descriptive details of participants are as follows: 48% were females; 52% were males; 38% attended 9th grade; 32% attended 10th grade; 30% attended 11th grade; 13% were members of environment clubs; and 87% were not.

Data Collection Tools

A recycling behavior scale developed by the researchers was used as a data collection tool. During the scale development process, a group of 40 high school students were asked open-ended questions following a review of related literature (Ajzen and Fishbein, 1980; Wright, 2011; Ando and Gosselin, 2005; Barr, 2007; Nixon and Saphores, 2009; Lansana, 1992). Items were created through the analysis of responses to open-ended questions and a question pool was formed with those items and other items obtained from literature review. The scale has 11 items. It has three dimensions: recycling behavior, recycling preferences and recycling interest. The KMO value of the scale was found to be .855. Its Bartlett's sphericity significance level was found to be 0.00, and its Cronbach's alpha reliability coefficient, .90. It is a 5-point Likert type scale with the response options of: "never," "rarely," "sometimes," "often," "always." Scores for each item on the scale range from 1 to 5.

Data Analysis

Data obtained in the research were analyzed through Pearson Correlation and Multiple Regression with SPSS 18 software package.

Findings

Findings of the study are presented in this section.

Table 1.

Pearson Correlation values associated with the relationship between high school students' recycling behaviors and variables

		Overall scale	*Recycling behaviors*	*Prefence*	*Interest*
Gender	*Pearson Correlation*	-,029	-,099	-,006	,048
	P	,803	,394	,958	,682
	N	132	132	132	132
Grade	*Pearson Correlation*	,098	,154	,033	,053
	P	,398	,185	,779	,650
	N	132	132	132	132
Membership in environment clubs	*Pearson Correlation*	-,244*	-,178	-,209	-,234*
	P	,034	,123	,069	,041
	N	132	132	132	132
İnterest to environment	*Pearson Correlation*	,256*	,288*	,272*	,059
	P	,025	,012	,017	,615
	N	132	132	132	132
Knowledge	*Pearson Correlation*	,491**	,558**	,424**	,220
	P	,000	,000	,000	,057
	N	132	132	132	132
Income level	*Pearson Correlation*	-,155	-,059	-,144	-,204
	P	,182	,613	,215	,077
	N	132	132	132	132
Age	*Pearson Correlation*	-,012	-,024	,016	-,025
	P	,915	,840	,889	,827
	N	132	132	132	132

As Table 1 shows, no significant correlation was found between variables such as gender, grade, income level, age and the entire scale or its recycling, preferences and interest subdimensions. However, significant correlations were determined between environmental club membership and the entire scale and recycling interest, between the anxiety about the future of environment and the entire scale, its recycling and preferences dimensions, between the recycling knowledge variable and the entire scale, its recycling and preferences sub-dimensions.

The multiple regression results of variables for the recycling behavior scale such as environmental club membership, anxiety about the future of environment, recycling knowledge are displayed in Table 2.

Table 2.

Multiple regression results associated with variables predicting the scale overall

	B	*Standart error*	*β*	*t*	*p*
Constant	24,999	7,723		3,237	,002
Environment club	-6,615	3,220	-,206	-2,054	,044
Concern	,376	1,186	,035	,317	,752
Knowledge	4,693	1,131	,460	4,150	,000
		R= 0,534	R^2=0,285	9,584*	

Table 3 shows that the variables explained approximately 29% of the variance (R^2=0.285). According to the regression model parameters, the standardized regression coefficients (β) show that the predictor variables for recycling behavior scale were, in order of importance, recycling knowledge (β=0.460, t=4.150, p<0.05), environmental club membership (β=0.230, t=2.817, p<0.05) and environmental anxiety (β=0.35, t=0.317, p>0.05). Thus, recycling knowledge and environmental club membership are significant predictors of recycling behavior, and environmental anxiety is an important predictor of recycling behavior.

The multiple regression results of variables, such as environmental club membership, environmental anxiety and recycling knowledge that predict the behavior dimension are displayed in Table 3.

Table 3.

Multiple regression results associated with variables predicting the behavior dimension

	B	*Standart error*	*β*	*t*	*p*
Constant	6,784	3,242		2,092	,040
Environment club	-1,873	1,352	-,134	-1,386	,170
Concern	,201	,498	,043	,403	,688
Knowledge	2,341	,475	,529	4,932	,000
		R= 0,576	R^2=0,332	11,912*	

Table 3 shows that the variables explained approximately 33% of the variance (R^2=0.332). When the regression model was examined, it was found that environmental club membership (β=0.134, t=1.386, p>0.05) and environmental anxiety (β=0.043, t=0.317, p>0.05) variables were not significant predictors of recycling behavior dimension; however, the recycling knowledge variable (β=0.529, t=4.932, p<0.05) was a significant predictor of recycling behavior dimension.

The multiple regression results of variables, such as environmental club membership, environmental anxiety and recycling knowledge that predict the recycling preferences dimension are displayed in Table 4.

Table 4.

Multiple regression results associated with variables predicting the recycling preference dimension

	B	*Standart error*	*β*	*t*	*p*
Constant	8,529	3,295		2,588	,012
Environment club	-2,263	1,374	-,173	-1,647	,104
Concern	,409	,506	,094	,809	,421
Knowledge	1,539	,483	,370	3,190	,002
		R= 0,468	R^2=0,219	F=6,715*	

Table 4 indicates that the variables explained approximately 22% of the variance (R^2=0.332). When the regression model was examined, it was found that the environmental club membership (β=0.173, t=1.347, p>0.05) and environmental anxiety (β=0.094, t=0.809, p>0.05) variables were not significant predictors for the recycling preferences dimension; however, the recycling knowledge variable (β=0.370, t=3.190, p<0.05) was a significant predictor for the recycling preferences dimension.

The multiple regression results of variables, such as environmental club membership, environmental anxiety and recycling knowledge that predict the recycling interest dimension are displayed in Table 5.

Table 5.

Multiple regression results associated with variables predicting the recycling interest dimension

	B	*Standart error*	*β*	*t*	*p*
Constant	9,687	2,997		3,232	,002
Environment club	-2,478	1,250	-,223	-1,890	,051
Concern	-,234	,460	-,063	-,508	,613
Knowledge	,812	,439	,230	1,851	,068
		R= 0,315	R^2=0,099	F=2,642	

Table 5 shows that there is no significant correlation between the environmental club membership, environmental anxiety and recycling knowledge variables and the recycling interest dimension ($R=0.315$, $R^2=0.099$, $P>0.05$). This means that environmental club membership ($\beta=0.063$, $t=0.508$, $p>0.05$), environmental anxiety ($\beta=0.230$, $t=0.230$, $p>0.05$) and recycling knowledge variables were not significant predictors of the recycling interest dimension.

Discussion

Recycling is one of the most frequently measured dimensions of environmentally sensitive behaviors since recycling makes important contributions to the economy and the environment (Iyer & Kashyap, 2007; Valle, Rebelo, Reis & Menezes, 2005). Variables that predict the recycling behaviors of high school students were examined in this study.

One of the results obtained from the study is the fact that no significant correlation was found between high school students' recycling behaviors and the gender, grade, family income and age variables. In the literature, Tindall, Davies and Maubulues (2003) found that gender is not an important determinant of environmentally sensitive behavior. Bakar and Aydınlı (2012) found that participants' plastic waste recycling did not vary significantly by their income level. Corral-Verdugu et al. (2003) found in their study that age is not an important predictor of recycling behaviors. Although these results are similar to those of this study, there are dissimilar results in literature. For example, Ando & Gosselin (2005) found that gender affected environmentally sensitive behaviors. Saphores et al. (2006) found that young adults have more tendency to participate recycling programs than the elderly. Daneshvary, Daneshvary and Schwer (1998) found that the income level variable is an important determinant of recycling behavior.

The fact that recycling knowledge, environmental student club membership and environmental anxiety variables are important predictors of recycling behavior is among the results found in the study. Schultz, Oskamp & Mainieri (1995) emphasized that knowing the benefits of recycling is an important factor that enables individuals to show recycling behavior. Mostafa (2007) stated that environmental knowledge is an important factor that affects environmentally sensitive behaviors. Being a member of environmental club and participating in environmental activities help students show interest in environment. Bamberg (2003) stated that environmental interest is an important factor that affects recycling behaviors.

When the results about recycling behavior sub-dimension were examined, it was determined that recycling knowledge variable was an important predictor of recycling behavior; environmental club membership and environmental interest did not predict recycling behavior. Wright (2011) found that recycling knowledge level is an important predictor of recycling behavior. Tonglet, Philips and Read (2004) found that previous experiences are important predictors of recycling behavior. This result is unlike the results of this study.

When the results for the recycling preferences sub-dimension were examined, it was found that the recycling knowledge variable was an important predictor of recycling preferences. Environmental club membership and environmental interest did not predict for the recycling behavior sub-dimension. Acquiring knowledge about recycling enables individuals to prefer recyclable products. Thomas (2001) stated that knowledge campaigns about recycling increase students' recycling behaviors. Dono, Webb and Richardson (2010) found that there are significant correlations between environmental volunteering and environmentally sensitive behaviors.

Moreover, it was also found that recycling knowledge, environmental anxiety and environmental club membership variables did not predict the recycling interest dimension.

Conclusion

As a result, it can be argued that there is a correlation between variables such as recycling knowledge, environmental club membership and environmental anxiety, and that among these variables, having knowledge about recycling is one of the most important predictors of recycling behavior. In other words, knowing about recycling and its benefits increases recycling behavior.

Recommendations

Given these results, the following recommendations can be made. The fact that knowledge about recycling and its benefits is the most important factor in enabling students to recycle is one of the study's results. Thus, activities that help students acquire knowledge about recycling should be carried out in lessons and activities about environment at schools.

Since being a member of a environmental club and carrying out environmental activities affect students positively in terms of recycling, the activities of environmental clubs at schools should be increased.

. . .

References

Ando, A.W. & Gosselin, A.Y. (2005). Recycling in multifamily dwellings: does convenience matter? *Economic İnquiry*, 43(2), 426–438.

Ajzen, I. & Fishbein, M. (1980). *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice Hall.

Bakar F. & Aydınlı B. (2012). Bilim ve sanat merkezi öğrencilerinin plastik, plastik atıkların geri dönüşümü ve çevreye etkileri konusunda tutumlarının incelenmesi (Batı Karadeniz Bölgesi Örneklemi). *X. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, Niğde.

Bamberg, S. (2003). How does environmental concern influence specific environmentally related behaviors? A new answer to an old question. *Journal of Environmental Psychology, 23*(1), 21-32.

Barr, S. (2007). Factors influencing environmental attitudes and behaviours - a UK case study of household waste management. *Environment and Behavior*, *39*(4), 435- 473.

Barr S., Gilg, A.W., *&* Ford NJ. A. (2001). Conceptual framework for understanding and analysing attitudes towards household-waste management. *Environt and Planning, 33*(11), 2025–48.

Byerne, S. & Regan, B. (2014). Attitudes and actions towards recycling behaviours in the Limerick, Ireland region. Resources, Conservation and Recycling, *87*, 84-96

Büyüköztürk, Ş., Kılıç Çakmak, E., Akgün, Ö. E., Karadeniz, Ş., *&* Demirel, F. (2008). *Bilimsel araştırma yöntemleri.* Ankara: Pegem Akademi.

Corral-Verdugo, V., Frías, M., Pérez, F., Orduño, V., & Espinoza, N. (2002). Residential water consumption, motivation for conserving water, and the continuing tragedy of the commons. Environmental Management, *30,* 527-535.

Davies, J., Foxall GR., & Pallister J. (2002). Beyond the intention-behaviour mythology: An integrated model of recycling. *Market Theory, 2*(1), 29-113.

Dono, J., Webb, J., & Richardson, B. (2010). The relationship between environmental activism, pro-environmental behaviour and social identity. Journal of Environmental Psychology, *30*(2), 178-186.

Ebreo, A. & Vining, J. (2000). Motives as predictors of the public's attitudes toward solid waste issues. *Environmental Management, 25*, 153-168.

Ebreo, A. & Vining, J. (2001). How similar are recyclıng and waste reductıon? Future orientation and reasons for reducing waste as predictors of self-reported behavior. *Environment and Behavior, 33*(3), 424-448

Erten, S. (2002). Kız ve erkek öğrencilerin evde enerji tasarrufu yapma davranış amaçlarının planlanmış davranış teorisi yardımıyla araştırılması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 22*, 67-73.

Hansmann R., Bernasconi, P., Smieszek, T., Loukopoulos, P., & Scholz R. (2006). Justifications and self-organization as determinants of recycling behavior: The case of used batteries. *Resources, Conservation and Recycling*, *47*, 133-159.

Iyer, E.S. & Kashyap, R.K. (2007). Consumer recycling: role of incentives, information, and social class. *Journal of Consumer Behaviour, 6*, 32–47.

Kayranli, B., Tankut, I., & Pampal S (2003). Industrial solid waste and operation of waste recycling stock exchange. *Paper presented in 5th National Environmental Engineering Conference, Ankara, October 1 to 4, 2003.*

Meriç, G. & Kayranlı, M. (2003). Endüstriyel katı atık yönetimi. *Ulusal Çevre Mühendisliği Kongresi*. Ankara.

Lansana, F. (1992). Distinguishing potential recyclers from non-recyclers: a basis for developing recycling strategies. *Journal of Environmental Education, 23*, 16-23.

Miranda, M. & Blanco, A. (2010). Environmental awareness and paper recycling. *Cellulose Chemistry and Technology, 44*(10), 431-449.

Mostafa, M.M. (2007). Gender differences in Egyptian consumers' green purchase behaviour: The effects of environmental knowledge, concern and attitude. *International Journal of Consumer Studies, 31*(3), 221-229.

Nigbur, D., Lyons, E., & Uzzell, D. (2010). Attitudes, norms, identity and environmental behaviour: Using an expanded theory of planned behaviour to predict participation in a kerbside recycling programme. *British Journal of Social Psychology*, *49*(2), 259-284.

Nixon, H. & Saphores, J. M. (2009). Information and the decision to recycle: results from a survey of US households, *Journal of Environmental Planning and Management*, *52*(2), 257-277.

Oskamp, S., Harrington, M., Edwards, T., Sherwood, P.L., Okuda, S.M., & Swanson, D.L. (1991) Factors influencing household recycling behavior. *Environment and Behavior, 23*, 494–519.

Saphores, J.D., Nixon, H., Ogunseitan, O., & Shapiro, A. (2006). Household willingness to recycle electronic waste: An application to California. *Environment and Behavior,* 38, 183-208.

Daneshvary, R. & Daneshvary, R.K., & Schwer, K. (1998), Solid-waste recycling behavior and support for curbside textile recycling. *Environment and Behavior*, *30*, 144-161

Schultz, P., Oskamp, S., & Mainieri T. (1995). Who recycles and when a review of personal and situational factors. *Journal of Environmental Psychology, 15*, 105-121.

Thomas, C. (2001). Public understanding and its effect on recycling performance in Hampshire and Milton Keynes. *Resources, Conservation and Recycling, 32*(3), 259-274.

Tindall, D.B, Davies, S., & Mau, B. (2003). Activism and Conservation Behavior in an Environmental Movement: The Contradictory Effects of Gender. *Society & Natural Resources, 16*(10), 909-932.

Tonglet, M., Phillips, P. S., & Read, A. D. (2004). Using the theory of planned behaviour to investigate the determinants of recycling behaviour: A case study from brixworth, UK. *Resources, Conservation and Recycling*, *41*, 191-214.

Spiegelman H. & Sheehan B. (2004). The future of waste. *BioCycle*, *45*(1), 59-63.

Valle, P, Reis, E., Menezes, J., & Rebelo, R. (2004). Behavioral determinants of household recycling participation: the Portuguese case. *Environment and Behavior, 36*(4), 505-540.

Vicente, P. & Reis, E. (2007). Segmenting households according to recycling attitudes in a Portuguese urban area. *Resources, Conservation and Recycling, 52*(1), 1-12.

Vining, J. & Ebreo, A. (1990). What makes a recycler? A comparison of recyclers and non recyclers. *Environment & behavior, 22*, 55-73.

Wright, Y. (2011). *Relating recycling: Demographics, attitudes, knowledge and recycling behavior among UC berkeley students*. UC Berkeley Student Recyling, [WWW Document]. URL http://nature.berkeley.edu/classes/es196/projects/2011final/WrightY_2011.pdf (accessed 10.21.2015).

APPENDIX 1.

Recycling Behavior Scale

Dear students,
The aim of this study is to investigate your recyling begaviours with various variables. Please fill in the blanks according to your ideas correctly. Thanks....
Dr. Osman ÇİMEN

Gender: ..... Age:.....Class level:.....

Membership in environment club: Yes ( ) No ( ) Income level:.....

Interest to environment: 1 2 3 4 5
Knowledge level to environment: 1 2 3 4 5

Recycling Behavior Scale	Never	Rarely	Sometimes	Often	Always
1.I do not throw batteries and plastics directly in the waste.	1❑	2❑	3❑	4❑	5❑
2. I carry waste glass with me until I find a recycling bin.	1❑	2❑	3❑	4❑	5❑
3. I purchase rechargeable batteries.	1❑	2❑	3❑	4❑	5❑
4. I prefer to buy products in reduced packages and in natural, recyclable packages.	1❑	2❑	3❑	4❑	5❑
5. I buy products in reusable containers, as much as possible.	1❑	2❑	3❑	4❑	5❑
6. As family members and friends come together, we talk about recycling.	1❑	2❑	3❑	4❑	5❑
7. I prefer to choose paper products made from reusable paper.	1❑	2❑	3❑	4❑	5❑
8. I follow news about recycling in newspapers and journals.	1❑	2❑	3❑	4❑	5❑
9. When I go on a picnic, I put aside the recyclable waste.	1❑	2❑	3❑	4❑	5❑
10. I follow videos of recycling on the Internet.	1❑	2❑	3❑	4❑	5❑
11. I separate waste at my home in order to get them reused.	1❑	2❑	3❑	4❑	5❑

International Electronic Journal of Environmental Education
Vol.6, Issue 1, 2016, 17-28
RESEARCH ARTICLE

Lise Öğrencilerinin Geri Dönüşüme Karşı Davranış Faktörlerinin Belirleyicileri

Osman ÇİMEN*
Gazi Üniversitesi, Ankara, TÜRKİYE

Mehmet YILMAZ
Gazi Üniversitesi, Ankara, TÜRKİYE

Alındı: Haziran 2015; Kabul Edildi: Aralık, 2015

Özet

Bu çalışmanın amacı, lise öğrencilerinin geri dönüşüm davranışlarını belirleyen değişkenlerin belirlenmesidir. Çalışma tarama modelinde tasarlanmıştır. Çalışmanın örneklemini Ankara'da bir lisede öğrenim gören 203 öğrenci oluşturmaktadır. Veri toplama aracı olarak araştırmacılar tarafından geliştirilmiş olan Geri Dönüşüm Davranışı Ölçeği kullanılmıştır. Ölçeğin üç boyutu vardır: geri dönüşüm davranışı, geri dönüşüme ilgi ve geri dönüşüm tercihleri. Ölçeğin güvenirlik katsayısı .90 olarak bulunmuştur. Veriler SPSS 18 paket programında Pearson katsayısı ve çoklu regresyon kullanımıyla analiz edilmiştir. Lise öğrencilerinin geri dönüşüm davranışlarıyla çevresel kaygı, geri dönüşüm bilgisi ve öğrencinin çevre kulübü üyeliği gibi değişkenler arasında anlamlı bir ilişki bulunmuştur. Ayrıca, bir değişken olarak geri dönüşüm bilgisinin genel olarak geri dönüşüm davranışı ve geri dönüşüm tercihleri boyutlarının anlamlı birer yordayıcısı olduğu tespit edilmiştir. Bu sonuçlar doğrultusunda önerilerde bulunulmaktadır.

Anahtar Kelimeler: Geri dönüşüm, geri dönüşüm davranışı, geri dönüşüm bilgisi, çevre kulüpleri.

ISSN: 2146-0329
*Sorumlu yazar: Osman Cimen,
E-mail: osman.cimen@gmail.com