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Early Childhood Turkish Children's Attitudes toward Science

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Abstract

The purpose of the study was to examine and describe the attitudes of Turkish early childhood children in science. This study explored the causal factors that influence children's attitudes toward science such as teachers' years of teaching experiences, frequency of teaching science in a week, and teachers' teaching style. Turkish children (N=44) who live in the United States and engage in early childhood classroom involved into the study. Preschool teachers who had Turkish children in their classroom completed survey for giving information about their Turkish children experiences in their science teaching activities. The Child's Attitude Toward Science (CATS) survey which developed by researchers was used while collecting data. The results showed that Turkish children have positive attitudes towards science especially in Life Science Topics. The results also showed that there were statistically significant relationships between Turkish children's attitudes towards science and their teachers years of teaching experiences and frequency of teaching science in a week. The results also showed that Turkish children's success in other activities (language, art, math) related with their attitudes towards science. The findings also showed that using text books and hands on activities during science education also had relationship with children's attitudes towards science.

Keywords: Early childhood education, science, attitude, Turkish children.

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Introduction

Quality education in the 21st century is dependent on a well-educated workforce. To that end, education has become globally focused with achievement test scores in literacy, math and science being compared across developing countries. The Program for International Students Assessment (PISA) showed that "In 2009, the percentage of high-performing 15-year-olds in the United States was higher in reading literacy, lower in mathematics literacy, and not measurably different in science literacy than the respective percentages in the OECD countries on average" (Aud, et al., 2012, p.68). That is why in the US; early childhood education has emerged as an important factor in efforts to improve education.

Researchers define early childhood as pre-primary programs including, preschool, and nursery school. In the United States, the effort to close the achievement gap is huge and early childhood is seen as an important tool for teachers who are concerned about children who come from disadvantaged life experiences such as; poverty, being English Language Learners (ELL) and other factors that can impact students' educational success. For example, students from low income families enter kindergarten with lover scores on tests of readiness (Copple & Bredekamp, 2009). Researchers also stated that "Concerns over the persistence of achievement gaps between subgroups are part of a larger concern about lagging students' achievement in the United States and its impact on American economic competitiveness in an increasingly global economy" (Copple & Bredekamp, 2009, p. 2). In 2001, the No Child Left Behind Act (NCLB) dictated that all children have equal opportunities in their education. This law covered students who are Economically Disadvantaged (E.D.), Not Economically Disadvantaged (N.E.D.), racial and ethnic minorities (White, Black, Hispanic, American-Indian, Asian, Pacific Islander, Two or More Races…etc.), special needs, English Language Learners (ELL), and Limited English Proficiency (L.E.P.).

Kamay and Kaşker (2006) identified that early childhood is a great time when children improve important life skills and scientific skills when provided with quality experiences. In these years, experiences help children learn basic skills in cognitive and social areas. Children can use these new skills in their daily life and build on them for the future. Developing these skills in the early years forms the foundation for learning new academic conceptions in later years. Helping children to improve science skills supports children not only to manage the events in daily life, but also helps them in future science and mathematics studies (Lind, 2000). However, early care and education focused on children's social, emotional, and physical development for many years. Children rarely focused on scientific skills and experiences. This was a big problem for teachers when they taught science to children because they tend to be uncomfortable with science instruction and had weak science backgrounds (Worth, 2010).

Science teaching in early childhood education does not mean teaching scientific knowledge, but rather giving opportunities children to learn this information by doing hands on activities as they make sense of their world (Aktaş, 2002). One common strategy to provide hands on experiences is the use of science centers which can be created for individual and group activities. Others stated that science education needs to be more than a place in the classroom or a set of materials. It needs to be a mind-set that encourages children's curiosity (Brenneman, Boyd, & Frede, 2009). Researchers identified that it is important for science to be taught in early childhood years so that pupils have positive attitudes toward mathematics and science. These positive attitudes affect children's future success in and out of school performance (Brenneman et al., (2009).

Furthermore, early childhood education gives rich opportunities to children for early thinking and learning. With a rich environment, guided by skillful teachers, children's experiences in the early years can have significant impact on their later educational achievement (Worth, 2010). That is why science may be a particularly important domain in early childhood, serving not only to build a basis for future scientific understanding but also to build important skills and attitudes for learning. Jones and Courtney (2002) stated in their research that early childhood classrooms are appropriate places for

children to make scientific discoveries. That is why preschool teachers can create their classrooms for everyday experiences because children like to explore how seeds are planted, living animals interact, and objects work.

According to the Houte, DeSmet, and Devliger (2012), teacher education programs show some differences from country to country and these differences affect teachers' work in preschool and primary classroom. Karamustafaoğlu and Kandaz (2006) stated that teachers should encourage students to participate to science activities. Teachers should give chances for students to do basic level of science experiments that incorporate the active learning process. During this time, with using different teaching styles depending on the subjects, teachers can help to improve students' interest toward science and nature. Yet, Tu (2006) investigated 20 preschool science environments for three to five-year-old children in 13 Midwestern child care centers. The study showed that half of the preschool classroom had science area. The activities that the preschool teachers engaged were mostly unrelated to science activities (86.8%), 4.5% of the activities were related to formal science teaching, and 8.8% of the activities were related to informal science teaching. Tu (2006) suggested that teachers need to use more on their own practice and utilize science tools for improving science teaching in preschool classrooms.

Bryan and Atwater (2002) studied teachers' beliefs and their impact on science teaching and learning. Researchers discussed three core ideas for deciding what teachers believe in their research: "(a) student characteristics; (b) external influences on learning; and (c) appropriate teacher responses to diversity" (p.827). Researchers decided that to know teachers' beliefs about teaching science in classroom is a significant part when teaching science to ELL students. Yet, there were limited studies about students' socioeconomic conditions, racial, different ethnic minorities and their learning science in in early childhood education.

The main purpose of this study is to investigate and describe the attitudes of Turkish children toward science. The study also explores the causal factors that influence children's attitudes toward science. Based on this purpose research question is: "What are the factors (such as successes in other activities, teachers' years of teaching experiences, frequency of using science activities in a week, time of using science in a day, qualities of science centers/areas in classroom, teachers' teaching style(s) in science activities) that affect Turkish children's attitudes towards science?".

Methods

Design of the Study

In the current study, survey method, one of the quantitative methods, was used for collecting children's abilities, interests, and attitudes toward science and science topics. When the research survey was created, science topics and Ohio State's science standards were profited by the researcher. Child's Attitude Toward Science (CATS) survey, as developed by researcher, was used to collect teachers' opinion about their Turkish children's attitudes towards science in early childhood education.

Participants

Eligibility for participation was limited to children who were in preschool, kindergarten and came from Turkish family background. In the current study, Turkish children who were in two preschools during fall semester of 2012, and both located in Ohio, were investigated for this research. These schools were selected for the current study because both schools have reported large Turkish student populations. Preschool teachers completed survey for giving information about their Turkish children's experiences in their science teaching activities. Teachers reported 44 surveys for their only Turkish children in preschool and kindergarten grades. Turkish children, who are also called Meskhetian (Ahiskan) Turks, must speak English at school and speak Turkish and Russian at home.

Instrument and Data Analyze

The Child's Attitudes Toward Science (CATS) survey was developed by the researcher. There were two parts in the survey. The first part inquired into the child's attitudes toward science topics and their demographic information. In first part, there are 24 items. In the first half of this part, there are 5 items about the child's age, gender, learning style (linguistic, logistic, physical, visual), success in science process (observing, measuring, classifying) and success in other activities (language, math, art). For success in science process and in other activities, items were evaluated as "one of the worst", "below average", "average", "above average", "one of the best". In the second half of the first part, there are the other nineteen items were comprised by three main subtopics (Earth and Space Science, Life Science, and Physical Science). The second half was related to the child's interest in the selected topic. This half also was used a 6-point Likert scale. Each item was evaluated with "not observed", "never", "rarely", "sometimes", "most of the time", and "always".

Questions were categorized with their interest topics. Earth and Space Science was covered by questions 1 through 6. These 6 questions were related to Earth and Space Science topics such as natural events, day and night patterns, and law of gravity. Life Science was covered by questions 7 through 13. These 7 questions were related to life science topics such as food chain, habitats, animals, plant. Physical Science was covered by questions 14 through 19. These 6 questions were about physical science topics such as states of matter, forces and motions, blocks, magnets, and light.

In the teacher's part of the survey was comprised by 7 items about teacher and curriculum. Items were reported Turkish children's size in class, teachers experience with Turkish children, frequency of teaching science activities, and time in science activities, teaching methods, qualities of science center or area, and materials in science areas. Qualities of science center/area were evaluated with "very poor", "poor", "fair", "good", and "very good". Time of teaching science activities scale was evaluated with "morning", "mid-morning", "afternoon", and "mid-afternoon".

The validity of the survey was tested in terms of content and construct validity. The content of validity was evaluated by two areas; early childhood education and science education. Validity of survey was tested by professionals. After survey was created, the survey was delivered to 24 undergrad students who were studying in Early Childhood Education at the University of Dayton. The pilot test was used for determining the reliability of survey. Item total correlations and Cronbach alpha values are obtained. The results of reliability test showed a Cronbach alpha of .71 for the entire instrument.

A one-way ANOVA was used with a Tukey Post-Hoc to examine the relationships of Turkish children's attitudes towards science on the other six variables (such as successes in other activities, teachers' years of teaching experiences, frequency of using science activities in a week, time of using science in a day, qualities of science centers/areas in classroom, teachers' teaching style(s) in science activities). The level of significance was set at .05.

Results

The researcher was investigating relationships between Turkish children's attitudes towards science and their successes in other activities, teachers' years of teaching experiences, frequency of using science activities in a week, time of using science in a day, qualities of science centers/areas in classroom, teachers' teaching style(s) in science activities.

Table 1. Frequency and percentages for children's attitudes toward science and science areas

Valids	ESS		LS		PS		COMP	
	f	%	f	%	f	%	f	%
Not observed	102	39	89	29	86	33	277	33
Never	5	2	6	2	6	2	17	2
Rarely	19	3	33	3	31	12	83	10
Sometimes	67	25	67	22	48	18	182	22
Most of time	39	15	66	21	58	22	163	19
Always	32	12	47	15	35	13	114	14

Table 1 displays frequency and percentages for children's attitudes towards science and science areas. In Table 1, data were coded as ESS (Earth and Space Science), LS (Life Science), PS (Physical Science), and COMP for all these areas total numbers. The classification "Not observed" means didn't observed (does not mean shows anything or low attitudes). "Always" means "child has very positive attitudes" and "Never" means "child does not have any attitudes" toward that science topic. Teachers reported 19 attitudes for a specific child. That mean is 836 attitudes were reported by teachers for 44 children. The majority 33 % (n=277) of children's attitudes in whole science areas had not observed by teachers. For observable attitudes: "Never", "Rarely", "Sometimes", "Most of time", and "Always", the majority 22 % (n=182) of children's attitudes in whole science areas, "Sometimes" was selected by teachers for describing Turkish children attitudes toward science. According to Table 1, Turkish children had very positive attitudes toward LS. They showed positive attitudes toward PS and ESS.

Table 2. Results of ANOVA scores of children' attitudes towards science according their success in other activities

Valids	N	M	SD	df	F	p
One of the worst	1	17.00	.	4, 39	3.35	.01
Below average	18	47.50	18.19			
Average	13	57.92	18.49			
Above average	9	57.77	17.88			
One of the best	3	83.00	32.90			

*p<.05

To test the relationship between Turkish children's success in other activities (language, art, math), a one-way ANOVA was run. The results of the one-way ANOVA are displayed in Table 2. The results [F (4,39) = 3.35, p<.05] revealed that Turkish children success in other activities (language, art, math) had statistically significant effect on children' attitudes towards science. According to the findings, if a child is successful in other activities (language, art, and math), he/she may show positive attitudes towards science in early childhood education.

Table 3. Results of ANOVA scores according to teachers' years of teaching experience with Turkish children

Valids	N	M	SD	df	F	p
Less than 6 month	14	43.14	4.80	2, 41	64.65	.00
3-4 years	23	48.56	13.10			
More than 4 years	7	96.14	10.00			

*p<.05

In order to investigate the relationship between Turkish children teacher's years of teaching experience and their attitudes towards science one-way ANOVA was run. The findings of the one-way ANOVA are displayed in Table 3. According to the ANOVA results [F (2,41) = 64.65, p< .05] teachers' years of teaching experience with Turkish children had a statistically significant relationship with children' attitudes towards science. As presented in the data, if teacher has long time experiences with Turkish children, his/her Turkish children show positive attitudes toward science.

Table 4. Results of ANOVA scores of children' attitudes toward science according frequency of using science activities in a week

Valids	N	M	SD	df	F	p
Less than 2 times	8	60.75	1.58	3, 40	4.07	.01
3-4 times	9	58.77	33.42			
5-6 times	19	43.42	4.14			
More than 7 times	8	69.25	28.33			

*p<.05

A One-way ANOVA was run for examining the relationship between frequency of using science activities in a week and Turkish children's attitudes towards science in early childhood education. The results of the one way ANOVA are show in Table 4. ANOVA results [F (3, 40) = 4.07, p<.05] showed that in early childhood education, frequency of using science activities had a statistically significant relationship with Turkish children's attitudes towards science.

Table 5. Results of ANOVA scores of children's attitudes toward science according time of using science activities in a day

Valids	N	M	SD	df	F	p
Morning	14	43.14	4.80	3, 40	3.31	.02
Mid-morning	9	68.33	24.59			
Afternoon	8	60.75	1.58			
Mid-afternoon	13	53.00	29.44			

*p<.05

In order to investigate the relationship between times of using science in a day and Turkish children's attitudes toward science in early childhood education, a one-way ANOVA was run. The results of the ANOVA are presented in Table 5. The results [F (3, 40) = 3.31, p<.05] revealed that in early childhood education, the time of day children engaged in science activities had a statistically significant relationship with children' attitudes toward science. The data showed that children had most interested with science during mid-morning.

Table 6. Results of ANOVA scores of children' attitudes toward science according qualities of science centers/areas

Valids	N	M	SD	df	F	p
Very poor	5	32.40	13.12	3, 40	12.63	.00
Poor	5	44.20	1.09			
Fair	22	49.54	9.50			
Good	12	76.75	25.91			

*p<.05

To investigate the relationship between qualities of science centers/areas and Turkish children' attitudes toward science, one-way ANOVA was used. The results of the ANOVA are shown in Table 6. The findings [F (3, 40) = 12.630, p<.05] showed that quality of science centers/areas had a

statistically significant relationship with Turkish children' attitudes towards science in early childhood education. According to the results, if the classroom had good science centers/areas, Turkish children showed positive attitudes toward science in early childhood.

Table 7. Results of ANOVA scores of children attitudes toward science according teaching style(s) (N = 44)

Valids	N	M	SD	df	F	p
Hands on Activities	14	59.71	22.73	3, 40	9.32	.00
Play Based Curriculum	14	43.14	4.80			
Text Books	11	72.00	19.31			
Others	5	32.40	13.12			

*p<.05

In order to investigate the relationship between Turkish children teachers' teaching style and their attitudes toward science in early childhood, an one-way ANOVA was used. The results of the ANOVA are presented in Table 7. The results of ANOVA [F (3, 40) = 9.32, p<.05] showed that teachers' teaching style had a statistically significant relationship with Turkish children' attitudes towards science in early education. According to the findings, while teaching science, using text books in classroom had a positive effect on Turkish children's attitudes toward science in early ages. The results also showed that hands on activities are as influential as text books.

Conclusions, Discussions and Recommendations

The results demonstrated that Turkish children had good attitudes towards science and science topics such as Earth and Space Science, Life Science, and Physical Science in preschools and kindergartens. Data results showed that Turkish children were mostly interested in Life Science topics when it compared with other scientific topics. In addition, Turkish children had interested in also Physical Science and Earth and Space Science topics in their preschool and kindergarten classrooms.

Bryan and Atwater (2002) stated that external factors that influence children's science learning. Gelman and Brenneman (2004) concluded that for the improving scientific skills, children need to connect their experiences which they learn during communication activities, literacy and art activities, and math activities. For example, during language and art activities, children may learn how they can represent their knowledge by the writing or drawing what they want to say. During mathematic activities in early childhood classroom, children may learn numbers, figures, and calculations which also related with science (Gelman & Brenneman, 2004). Their success in these activities may impact also their learning science. In the current study, it is found that children's success in other activities such as language, art, mathematic had related with their learning science. The data results showed that, if Turkish children were success in other activities, it is positively impacts their learning in science. It is probably related with how they represent themselves in classroom. In addition, teachers of classroom had chance to know about Turkish children's skills in science and other activities. That is why, they may have more chances to do science activities due to their children's interested. The current study also suggested to importance of integrating science with other contents in early childhood.

Culture has been studied in science education research based on children' socioeconomic conditions, racial, and different ethnic minorities. However, literature review show that there were limited studies in early childhood education. According to the Bryan and Atwater (2002) one of the main factor was teacher that influence students' learning. In early childhood, children use ideas, directions, and descriptions orally or in written forms such as pictures, maps, graphs, and reports when they explain their scientific explorations. Communicating is important for children to explain information and understand what they mean (Lind, 1996). In education, teachers should know their children' communications skills when they interact with them. Consistent with Gillette (1998) about

the importance of teachers being at least culturally sensitiveness in education. The current study showed that if teachers work on extended period of time with Turkish children, their Turkish children show positive performances when learning science. On the other hand, understanding Turkish children's skills, abilities, and interests by the communicating, teachers help their ELL children's learning science in the early years. Spending more time with one cultural group in classroom, it may help to classroom teachers to get know more about that cultural expects from teachers and education systems.

Interestingly, this study appears to be a first in the field with investigated best time of day for teaching science and frequency of teaching science in a week for multicultural groups. These topics are investigated for trying to find the best time for teaching science to Turkish children in early childhood education. This idea comes from readiness to learn science phenomena. It is found that, teachers should give science activities at least 5-6 times in a week. This helped their Turkish children while learning and getting positive attitudes towards science. Worth (2010) stated that if teachers don't give time to science activities regularly, their children's learning about scientific skills may reduce or lost. Likewise, Tu (2006) stated that most of teaching in early childhood classroom were not related with science. That is why children may not have more chances to improve their scientific abilities. Karamustafaoğlu and Kandaz (2006) suggested that teachers should give chances for students to do basic level of science experiments that incorporate the active learning process. It is found in the current study that teachers should do that at least 5-6 times in a week if they want to help their children on learning science. In addition, the current study also found that when teachers give science activities in the mid-morning time, Turkish children's concentrations can be high for learning that science topics. Similarly, Worth (2010) also suggested that teachers may give time in morning and it can be circling routine while helping children for good science investigation. It should be 20 or 30 minutes activities that engage children into science during a week. In addition, teachers should give enough time to their children for documenting and science talking (Worth, 2010).

There was no doubt about quality of science centers/areas and its positive relationship with child development (Jones & Courtney, 2002; Tu, 2006; Worth, 2010). Well designed science centers are important for individual and/or small groups activities of children to learn science. Furthermore, early childhood classrooms are appropriate places for children to make scientific discoveries. That is why preschool teachers should create their classrooms for everyday experiences because children like to explore how seeds are planted, living animals interact, and objects work (Jones and Courtney, 2002; Tu, 2006). Moreover, teachers should provide richer and more challenging environments and tools for children's learning science. In these environments, children may have more experiences in science centers by the guided skillful teachers (Worth, 2010). Likewise, the current study reported the importance of qualities of science centers/areas for Turkish children's attitudes regarding science. On the other hand, Turkish children may have chances to built on their scientific skills and improve their learning by the creating wealthy and more dynamic centers.

Felder and Henriques (1995) suggested that students learning style(s) and teachers' teaching styles have unfortunate effects on the quality of the students' learning and their attitudes regarding subject. Similarly, findings of current study presented the importance of instructors' teaching style(s) on Turkish children' attitudes toward science. It is found that, using texts books and hands on activities had positive impacts on children's learning science and engaging science activities in classrooms. Likewise, Brenneman and Louro (2008) investigated the importance of using science journals in preschool as science tools for supporting and assessing child's learning science and science literacy. In addition, researchers stated science journals give more chances to children to make observation and improve their scientific skills (Brenneman & Louro, 2008). In another study, Foley and McPhee (2008) found that students who engaged in hands on classes had a better chance of understanding the nature of science than students who engaged in text book classes. Similar results were stated also in Varley, Murphy and Veale (2008) studies. Researchers stated 87% of pupils who were in the case study questionnaire and 78% of pupils who were in the survey showed extremely positive attitudes regarding hands on science. However, Pine et al. (2006) reported that students who engaged in teaching science with hands on classes had no significant differences in their science

knowledge and skills as compared to students who engaged in text books classes. The current study reported Turkish children who engaged in using text book for teaching science showed more positive attitudes regarding science as compared to Turkish children who engaged in using hands on activities for teaching science in early childhood education.

For further studies, current study focused on the Turkish children's attitudes towards science in early childhood education. Findings showed Turkish children were interested in science especially in Life Science areas. For further researchers who are interested in science education in early childhood, considerations should be given to other subgroups, such as African-American, Hispanic American, European-American, and Asian-American children' interests in science in the USA. In addition, this study investigated some external effects on learning science such as qualification of science centers/areas, teaching experience, teaching styles, frequency of using science activities, and ideal time of teaching science. Teaching experience had a positive relationship with Turkish children' attitudes towards science. Teachers should try to know more about their students' skills who come from different cultural backgrounds during their teachers' experiences.

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