Yaşadıkça Eğitim, Cilt 33, Sayı 2, Yıl 2019, s. 202-215.
Journal of Education for Life, Volume 33, Issue 2, Year 2019, pp. 202-215.
DOI: 10.33308/26674874.2019332105

A Case Study in University and Community Integration: Science Meets with Children at University[1]

Neriman ARAL[*]
Ece ÖZDOĞAN ÖZBAL[**]
Figen GÜRSOY[***]
Saliha ÇETİN SULTANOĞLU[****]
Ezgi FINDIK[*****]
Aybüke YURTERİ TİRYAKİ[******]

Abstract: This study was undertaken to investigate whether children's perceptions of science and scientists changed following their participation in the science education program within the scope of "Science Meets with Children at University"- the project which was initiated at Ankara University by Ankara Development Agency, and it was also intended to find out whether the science education program affected children's future job choices. Within the scope of the project "Science Meets with Children at University", 6319 children attended half-day education sessions. "Questionnaire of Views on Science and Scientists" was administered to 4688 of the children who volunteered to take part in the study. The results indicated that there were changes in the views of the children following the education program, their views on science and the scientist changed positively after education program 90,4% of children reported they would like to choose a science-related career in the future and 90.1% of them said they would like to attend the education program again.

Keywords: Science, Science Education, University and Society, Society and Science

Üniversite ve Toplum Bütünleşmesinde Örnek Bir Uygulama: Bilim Üniversitede Çocuklarla Buluşuyor

Öz: Ankara Üniversitesi'nde Ankara Kalkınma Ajansı desteği ile gerçekleştirilen bu araştırmada, Bilim Üniversitede Çocuklarla Buluşuyor kapsamındaki bilim eğitimi programlarının çocukların bilim ve bilim insanına ilişkin algılarında programa katılımlarının etkisinin olup olmadığı ve bilim eğitimi programlarının çocukların gelecekteki meslek seçimlerini etkileyip etkilemediğinin incelenmesi amaçlanmıştır. "Bilim Üniversitede Çocuklarla Buluşuyor!" projesi kapsamında Ankara ili içerisindeki 6319 çocuğa programlar tarafından gerçekleştirilen eğitimler yarım gün olarak verilmiştir. Çalışmaya katılan çocuklardan gönüllü olan 4688'ine etkinliğin öncesinde ve sonrasında Bilim ve Bilim İnsanı Hakkındaki Görüşler Anketi uygulanmıştır. Elde edilen veriler incelendiğinde çalışmaya gönüllü katılan çocukların eğitime katılımından önceki görüşleri ile eğitime katıldıktan sonraki görüşleri arasında değişiklikler olduğu, bilime ve bilim insanına olan görüşleri, eğitim sonrasında olumlu yönde değiştiği, %90,4'ünün eğitimler sonrasında gelecekte bilim ile ilgili bir meslek seçmek istediklerini belirttiği, %90,1'inin ise eğitimlere tekrar katılmak istediklerini ifade ettikleri saptanmıştır. Elde edilen sonuçlar doğrultusunda çocukların bilim hakkındaki düşüncelerinin olumlu yöne kayması adına yaparak yaşayarak gerçekleştirilen çocuk merkezli bilim eğitimlerin yaygınlaştırılmasının önemli olduğu söylenebilir.

Anahtar Sözcükler: Bilim, Bilim Eğitimi, Üniversite ve Toplum, Toplum ve Bilim

Received:14.02.2019 Accepted:05.08.2019 Article Type: Research Article

[1] This research is presented as an oral presentation at 3rd International Eurasian Educational Research Conference on 31 May-3 June 2016.

[*] Ankara University, Faculty of Health Sciences, Department of Child Development, Ankara, Turkey, e-mail:aralneriman@gmail.com, ORCID: https://orcid.org/0000-0002-9266-938X

[**]Ankara University, Faculty of Educational Sciences, Department of Elementary Education, Ankara, Turkey, e-mail: eozdogan@ankara.edu.tr, ORCID: https://orcid.org/0000-0002-6876-183X

[***]Ankara University, Faculty of Health Sciences, Department of Child Development, Ankara, Turkey, e-mail: gursoyf@gmail.com, ORCID: https://orcid.org/0000-0002-6199-4024

[****]Ankara University, Faculty of Health Sciences, Department of Child Development, Ankara, Turkey, e-mail: salihacetin46@gmail.com, ORCID: https://orcid.org/0000-0003-1374-2399

[*****]Ankara University, Faculty of Health Sciences, Department of Child Development, Ankara, Turkey, e-mail: efindik@ankara.edu.tr, ORCID: https://orcid.org/0000-0002-0466-7131

[******]Ankara University, Faculty of Health Sciences, Department of Child Development, Ankara, Turkey, e-mail: ayurteriii@gmail.com, ORCID: https://orcid.org/0000-0002-9475-4844

To cite:/Atıf için
Aral, N., Özdoğan Özbal, E., Gürsoy, F., Çetin Sultanoğlu, S., Fındık, E. & Yurteri Tiryaki, A. (2019). A case study in university and community integration: Science meets with children at university. *Yaşadıkça Eğitim*, *33*(2), 202-215.

In the progress of societies, sustainability plays a significant role in cultivating individuals who know how to acquire and use scientific knowledge. Science is a process that starts with observations on phenomena and objects and makes deductions by formulating hypotheses about the reasons based on these observations, and it refers to the acquisition, improvement and modification of the new knowledge. Scientific thinking and skills need to be developed for the science to move in the positive direction (Arslan & Çakıroğlu, 2006; Büyüktaşkapu, 2010; Doğan Bora, Duschl, Schweingruber & Shouse, 2007)

In a broad sense, science is described as both the body of knowledge and the activities that give rise to that knowledge (Zimmerman, 2000). In this sense, given that science is a process starting with questioning and curiosity, it can be said that all children are born as a scientist. Children gain new experiences and explore the world by observing their environment. It is therefore important that children become familiar with the science and acquire science process skills. Though children's thinking styles are generally identified by terms such as "misunderstanding", "misconception", "prejudice", "pseudo-knowledge" and "naive" (Havu-Nuutinen, & Ahtee, 2007; Holmes, Liden & Shin, 2013), it is stated that scientific thinking skills believed to emerge during childhood and adolescence (Kuhn & Pearsall, 2000) and the scientific research processes of scientists show similar characteristics (Driver and Easley, 1978). It is noteworthy that children acquire these processes including the skills of observation, classification, measure, communication, prediction and deduction since these skills contribute to the development of children in many areas, especially in the area of cognitive development (Büyüktaşkapu, 2010; Charlesworth & Lind, 2013; Peters & Stout, 2006; Şahin, 2000).

Today, advances in science and technology determine the level of development of countries and new trends therefore have begun to appear in order to engage children in science and technology (Turkish Academy of Sciences [Türkiye Bilimler Akademisi], 2013). It is known that there is a significant relationship between the growth of science in society and children's early interaction with it and the level of development and welfare of nations, and it is even seen that the development levels of countries increase thanks to the science. Odell, Hewett, Bowan and Boone (1993) found that children's perceptions and stereotypical images of scientists have an effect on their career plans. Building awareness of science among children at early ages is important in terms of nurturing the scientists of tomorrow and choosing a science-related career in the future. Science-related concepts can develop naturally by themselves or they can be learnt through a planned education (Kandır, Yaşar, İnal, Yazıcı, Uyanık & Yazıcı, 2012). What matters here is to evoke children's sense of curiosity and offer experiences that help them explore and actively participate, instead of simply presenting the knowledge and expecting them to memorize it (Lind, 2001).

A large body of research emphasize the importance of children's interaction with science at early ages (Eshach & Fried, 2005; Howes, 2008; Siry & Kremer, 2011; Yoon & Onchwari, 2006). Science education enables children to systemize the knowledge they, starting from birth, have gained through their observations on the environment, nature and life, and it also enriches the process that allows children to attain scientific knowledge by supporting their innate curiosity (Bathgate, Schunn & Correnti, 2014; Luce & Hsi, 2015) Science education adopts an approach that focuses on the process instead of the outcome and in which students are active learners, rather than a traditional approach in which children take on passive roles while teachers are the centre of the process (Uyanık Balat, 2010). Besides, it helps children better understand science when they are given a chance to talk about science and take part in interactive activities based on a scientific phenomenon (Siry & Lang, 2010). At this point, providing child-centred activities and practices, the teachers showing a leadership in a way to let children participate actively and the observations made on each child throughout the process (Çalışkan & Turan, 2010) will support children's engagement with science and their involvement in scientific processes. Moreover, institutions like science centres that enable children's active participation in science-related activities have a significant place in science education (Danilov, 2010).

It is important and essential in science education that children have a chance of making direct observations and get first-hand experiences in the nature. In a study, children were given science education, some using real materials while others simulators, and it was found that children working with real materials, compared to those using simulators, were better at transferring what they learnt into their everyday life (Bilek, 2010). For that reason, there is a need to create environments that will give children an opportunity to make observations.

Materials and teaching methods hold an important place in children's understanding of scientific concepts and knowledge (Jurow & Creighton, 2005). These might be influential in the development of their scientific thought and imagination, in making connections between the facts and concepts they meet in their environment and in increasing their level of scientific literacy (James, 2013). At this point, there is a need for institutions that produce knowledge and nurture scientists and a need for their role in leading people to science education studies. Science education does not always have to take place at school or laboratory. Though it is thought that science-related learning experiences are mostly gained at school, the reality is that much of learning experience is gained in socio-cultural context outside schools (Osborne & Dillon, 2008; Shaby, Assaraf & Tishler, 2016; Tscholl and Lindgren, 2016). Informal science learning environments might help children develop a positive attitude towards science (Bamberger & Tal, 2007). Children can be offered science education in many parts of life. It is seen that centres that draw children into science at early ages have been established across the globe in recent years. At this point, the universities where science is produced and where scientists work are gaining importance. Universities take on key roles in popularizing science and providing science education through correct channels. Besides producing science, universities are mostly responsible for establishing the relationship between science and the society (Ozdogan Ozbal & Aral, 2015). For that reason, universities play a fundamental role in making children interested and engaged in science. Besides providing higher education, universities help children grow up as individuals who wonder, criticise and question by bringing children and science together and integrating them into the society (Dworsky, 2015). Accordingly, children's universities or children's science centres established in universities have taken on leading roles in assisting them in their path to successful integration with society.

In the literature, there is a variety of studies in relation to children's contact with science or the development of scientific thought. In their study investigating children's opinions on the phenomena related to the natural sciences, Siry and Kremer (2011) studied with 5-6 year-old children and they found that peer or group work creates opportunities for co-learning and learning from each other. In another study, Metin and Leblebicioğlu (2011) investigated the effect of a science camp on the views of sixth and seventh graders about science. They found that children's views about science reached a more scientific level, their learning experiences related to scientific processes such as data collection, measure and interpretation increased and children gained a more detailed knowledge of scientific process by the end of the camp experience.

A review of related studies (Akgündüz et al., 2015) carried out in Turkey indicate that studies offering the opportunity that children can actively be involved in the process are still in the early stages. An overview of the studies conducted abroad show that there are many studies focusing on topics such as science education or scientific thinking skills at early ages (Klahr, Zimmerman & Jirout, 2011; Kuhn, 1993). At this point, it is thought that children's science centres or children's universities assume important responsibilities with regard to facilitating integration with society, building an awareness of science and scientists and developing a positive attitude towards science. It is also important for children to choose the profession of scientists. In the process of choosing a profession, it is important to break prejudices towards a profession and to have knowledge about the profession from an early age. Though there are many approaches related to job choices of children, it is usually stressed that these choices are largely affected by the family, personal traits of the child, the existing social structure, economic conditions, policies and education (Yaylacı, 2007). It can be ensured that meeting children with scientists and scientists from an early age will break these prejudices and encourage them to choose this profession.

The purpose of this study is therefore to help primary school children of different age groups develop an awareness of science, scientists and scientific point of view, to investigate whether children's perceptions of science and scientists have changed following their participation in the science education program within the scope of project called "Science Meets with Children at University", which was initiated at Children's University of Ankara and financed by Ankara Development Agency and to find out whether the education provided for children affected their future job choices. In the scope of the project, the education programs within the body of Ankara University Coordinatorship of Children's Science Center (Anyone Who Does Not Like Math?, Insect Festival School, School of Astronomy, Water School, DNA-the Code of Life, School of Life

Sciences, Who Shakes Our World?, My Little Friends- Insects, Creative Art, School of Nature Science, Kid Gardeners) were implemented with children. Before and after the programs children's views about science, scientists and future job choices were taken. This study will therefore address the following research questions:

- Is there a change in children's perceptions of science following their participation in science education?
- Is there a change in children's perceptions of scientists following their participation in science education?
- Does science education have an effect on children's future job choices?

Method

Research Model

The current study utilized a single-group pretest-posttest design in order to identify future job preferences of children and their perceptions of science and scientists prior to and following the education program and to measure the effect of the provided science education. In the design, children's perceptions of science and scientists and their future job choices constituted the dependent variable while education programs pertaining to different disciplines of science made up the independent variable.

Participants

The Project "Science Meets with Children at University" was carried out with children living in the centre of Ankara. Those who volunteered to participate in the science program within body of Ankara Children's University were included in the project. Within the scope of the project, 6319 children in Ankara attended half-day education sessions in various parts of the university between January and June 2015 based on the programs related to the different disciplines (Agriculture, Antropology, Astronomy, Biology, Enginnering, Mathematics) of science. The questionnaires completed by 4688 of the children who volunteered to be a part of the study were included in the analyses. Of these 4688 children, 51.1% were female, 49.9% were male, and majority of them (52.8%) were third and fourth grade students. More than fifty percent of the participants were selected from regions with low socio-economic status. The participant group consists of students studying in public schools.

Data Collection Tools

The data of the study was collected using the "Questionnaire of Views on Science and Scientists". For this questionnaire, a review of literature was first performed and then a pool of questions was created. Expert views were sought on the pool of questions and the questionnaire was then modified based on the expert views and administered to two children from the age groups of 7-14 years. Necessary corrections and modifications were done for questions causing ambiguity and the questionnaire form was made ready to use for the sample. The questionnaire form consists of two chapters. In the first chapter there are questions with regard to gender, age and grade level while the second includes questions regarding the expectations about the education, the purpose of the education, concepts related to the word "science", whether to be a scientist in the future and children's future job choices. Following the science education, children answered the extra question "Would you like to take part in this education program again?" at the end of the questionnaire form. Some examples of questions;

- Which of the following might be the purpose of the event you attended? Please specify the two most appropriate for you.

  1. Meeting with scientists
  2. To recognize a branch of science
  3. Meeting the fun side of science
  4. Other …….

- Which of the following or which could be related to the word science? (Specify 3 suitable for you)

  1. Entertainment
  2. Work hard
  3. Boring
  4. Innovations
  5. Loneliness
  6. Very difficult
  7. Enjoyable
  8. Research
  9. Other …….

- Which profession do you want to choose in the future? .....

In order to ensure the scope validity of the research, the draft questions examined by five field experts were tested with 30 children in a pilot study and the questions were finalized. In order to provide validity and reliability, it was ensured that the researchers reached consensus on the questions requiring category such as occupational knowledge or the purpose of the research. In order to ensure the reliability of the analysis, the data were coded and evaluated separately by the researchers.

Education Programs

Within the scope of the project, the education programs within the body of Ankara University Coordinatorship of Children's Science Center (Anyone Who Does Not Like Math?, Insect Festival School, School of Astronomy, Water School, DNA-the Code of Life, School of Life Sciences, Who Shakes Our World?, My Little Friends- Insects, Creative Art, School of Nature Science, Kid Gardeners) were implemented with children. These programs have been developed by various disciplines of science based on the "Program Development Guide" and assessed and confirmed by the members of the science board and the board of directors of Ankara University Coordinatorship of Children's Science Center. These programs are briefly described below.

Anyone Who Does Not Like Math? - The purpose of this program is to help students make connections between science and everyday life, discover the nature of science and scientific method, realize the relationship of math with arts and sport, and discover the lively aspect of science by having fun as well as raising an awareness of the role of math in our life. Insect Festival School – This program intends to develop consciousness on ecology by building an awareness of insects, encourage scientific studies and lesson children's negative feelings such as fear and disgust, which are usually based on false information, and allow them to develop healthy attitudes towards insects. School of Astronomy helps children be familiar with the science of astronomy at earlier years of life and gives them an opportunity to know about the extraterrestrial life. Water School aims to introduce and popularize aquatic ecosystems as one of our major natural resources throughout the education program on water and wetlands and to form a background by raising an awareness of their protection among primary and secondary school students. DNA-The Code of Life – The purpose of this program is to teach children an increasingly important molecule, the DNA molecule that forms the basis of molecular biology and genetics. School of Life Sciences – In this program, the goal is to help children know about themselves biologically, offer them an opportunity to perform measurements and examinations on main body parts and bones, provide information about the body structure of humans and the characteristics which distinguish us from other species, get them know about their own body types and understand which sports their body is suitable anatomically and explain the biological and cultural changes human beings have undergone from past to present by providing tangible evidence. Who Shakes Our World? – This program was developed to raise awareness of what happens underground during an earthquake and its observable effects on the Earth's surface and teach students what precautions to take before an earthquake occurs and how to act so that they can keep themselves safe during earthquakes. My Little Friends- Insects is an education program developed to convince children that not all insects are harmful or dangerous and there are insects that are very useful for our life. School of Creative Arts – the main aim of this program is to build awareness of artistic point of view, aesthetic values and various kinds of arts. School of Nature Sciences intends to teach 5-6 year-old children the basic principles of the nature events and develop an awareness and sensitivity towards the nature and its inhabitants. The purpose of the education program Kid Gardeners is to introduce agricultural products and agricultural production processes to primary school children aged 10-11 years and help them learn by watching and doing, give them a chance to explore the nature and the cycles of nature,

increase their love of nature by arousing their curiosity about nature and improve their physical and social skills using the approach "learning through play".

Data Collection and Analysis

The implementation process of each program is lengthened and shortened according to the content of the program. Some programs were implemented half a day while some programs were implemented as a full day. 15 minutes before and after the implementation of the programs is reserved for the implementation of pre-test and post-tests. The data collected prior to and following the science education using the Questionnaire of Views on Science and Scientists was evaluated and then entered into the computer for data analysis. The data obtained was analysed in terms of frequency and percentages.

Results

In order to investigate whether children's perceptions of science and scientists changed and find out whether the education provided for children affected their future job choices, 4688 children were included in the study which was undertaken within the scope "Science Meets with Children at University", a project which was initiated at Ankara University with the support of Ankara Development Agency. The collected data was presented below. In order to identify children's expectations before education, they were asked "What do you think might be in the education you will participate in?" The collected data was given in Table 1.

Table I

Distribution of children's expectations about science education program

Expectations About Education	N	%
Acquiring Scientific Knowledge	1406	30
Enjoyable Activity	681	14,5
Doing a Class	2106	44,9
Problem Solving	806	17,2
Reading Books	502	10,7
Other	398	8,5

As can be seen in Table 1, 44.9% of the children participating in the education programs expected to study lesson, prior to the education. As 30% of the children were already informed by their teachers, it was not surprising that they knew they would acquire scientific knowledge. The reason for this is that some teachers give information to the students in advance by giving information about the program they will attend.

The views of the participating children about the purpose of education were examined prior to and following the education program and the results were presented in Table 2.

Table II

Distribution of children's views on the purpose of education prior to and following the education program

Purpose of Education	Prior to Education		Following Education	
	n	%	n	%
Meeting with Scientists	1544	32,9	1698	36,2
Learning about a scientific discipline	2392	51,0	2983	63,6
Exploring the fun side of science	2542	54,2	3480	74,2
Other	209	44,6	522	11,1

As shown in Table 2, more than half of the children thought that the purpose of the education was to learn about a scientific discipline (51.0%) and to explore the fun side of science (54.2%). After education program, it was seen that 63.6% of the children responded that the purpose of the education was to learn about a scientific discipline and 74.2% stated that the purpose was to explore the fun side of science. Before the education took place, those who gave their answers as other explained the purpose of the education using expressions such as learning mathematics, learning science, doing a class, gaining knowledge or studying. Following the education, it was seen that they gave explanations such as love of animal, having fun, learning by playing and love of science regarding the purpose of the education.

Distribution of children's views about science-related concepts before and after the education program was indicated in Table 3.

Table III

Distribution of children's views about science-related concepts before and after the education program

Science-Related Concepts	Prior to Education		Following Education	
	n	%	n	%
Fun	258	5,5	987	21,1
Working hard	822	17,5	785	16,7
Boring	453	9,7	121	2,6
Innovations	508	10,8	741	15,8
Loneliness	545	11,6	229	4,9
Too hard	908	19,4	201	4,3
Enjoyable	457	9,7	818	17,4
Research	526	11,2	614	13,1
Other	211	4,5	192	4,1

As evidenced by Table 3, %19.4 of the children found science too hard, 5.5 % of them saw it as fun prior to the education. On the other hand, following the education children found science %21.1 fun and % 2.6 boring.

Some changes were observed in the responses of participant children following the education program. They mostly associated science with the concepts fun (21.1%), enjoyable (17.4%) and working hard (16.7%) after the education program.

Before and after the education, responses were sought and received on children's future job choices and these responses were given in Table 4.

Table IV

Distribution of children's responses about their future job choices before and after science education program.

Future Job Choices	Prior to Education		Following Education	
	n	%	n	%
Teacher	1188	25,3	907	19,3
Police Officer	1273	27,2	798	17,0
Doctor	411	8,8	671	14,3
Judge- Lawyer	103	2,2	98	2,1
Pilot	51	1,1	61	1,3
Scientist	0	0,0	306	6,5
Architect	304	6,5	299	6,4
Engineer	1073	22,9	1107	23,6
Biologist	0	0,0	153	3,3
Veterinarian	41	0,9	67	1,4
Astronaut	11	0,2	52	1,1
Fashion Designer	12	0,2	7	0,1
Sportsman	61	1,3	78	1,7
Homemaker	59	1,3	1	0,0
Other	101	2,2	83	1,8
Total	4688	100	4688	100

As it is seen in Table 4, 27.2% of the children preferred to be a police officer and 25.3% said they wanted to be a teacher prior to the education. However, following the educaction, an increase was observed in the percentage of the children who wanted to be an engineer (23.6%); especially a significant increase was seen in the number of children who preferred to be a scientist (100%) and those preferring to be a doctor (50%), whereas the number of children preferring to be a teacher and police officer declined. Besides, those who wanted to be a homemaker decreased in number and only one child was persistent that she still wanted to a homemaker. Another remarkable point is about being a biologist. While no one stated that they wanted to be a biologist before the trainings, 153 children wanted to become a biologist after the trainings. It is thought that this situation arises from the fact that children do not know that science or do not know what this branch of science are doing before the education program. During the education program they have a chance to see

science applications and the employees working in this science.

Before and after the education program, the children were asked whether they would like to be a scientist in the future and the results were shown in Table 5.

Table V
Distribution of children's responses regarding whether to be a scientist in the future (N=4688)

	Yes %	**No %**
Pretest	67,8	32,2
Posttest	72,6	27,4

As indicated in Table 5, a positive increase was observed following the education in the responses of children as regards whether they would like to be a scientist, when compared to their pre-education responses. On the other hand, the question "Would you like to participate in the education again?" was asked to children. It was also found that majority of children (90.1%) would like to participate in the education again.

Discussion

The purpose of the study was to investigate whether children's perceptions of science and scientists changed and whether the education provided to children affected their future job choices. 49.9% of the children participated in the study thought that they would do a class in their science education prior to the implementation of education program. As 30% of the children were already informed by their teachers, they naturally predicted that they would acquire scientific knowledge. Science education is thought to enable children's active participation by stimulating their interest and curiosity as it is child-centered and based on hands-on activities. It is argued that traditional approach, in which students assume a more passive role with the teacher in the center of the whole process, is adopted in science education (Uyanık Balat, 2010). The analysis of children's responses showed that passive activities such as doing a class or acquiring scientific knowledge outweighed the activities requiring active involvement. Demir and Akarsu (2013) investigated the views of 31 sixth and seventh grade students about "the nature of science" and found that majority of the children had a traditional point of view regarding the nature of science. This research is important in terms of revealing children's perceptions of how to obtain information about a science. Children's perception of being passive in a science education process may limit their involvement.

Children's views about the purpose of the education program indicated that more than half of the children thought the purpose of the education was to find out about a scientific discipline (51.0%) and explore the fun side of science (54.2%). Following the education program, 63.6% of the children expressed that the purpose was to learn about a scientific discipline and for the 74.2% of them the purpose was to explore the fun side of science. Before the education took place, those who gave their answers as other explained the purpose of the education using expressions such as learning mathematics, learning science, doing a class, gaining knowledge or studying. Following the education, it was seen that they gave explanations such as love of animal, having fun, learning by playing and love of science for the purpose of the education. It is believed that children benefit more from the task-based activities that allow them to learn by doing and be involved in the process active learners. Studies (Aydede & Kesercioğlu, 2012) show that active learning environments, in this sense, are of great importance to the children as these environments are designed in a way to keep them active throughout the learning process and offer opportunities to acquire knowledge through real-life experiences. As observed in this study, active participation of children in educational programs increased the effectiveness of the study and knowledge was acquired through real life experiences.

Analysis of the children's views about science-related concepts revealed that before the education 19% of the children found science too hard, 11.6% of them saw it as loneliness and 9.7% thought it was boring prior to the education. On the other, science was also associated with positive concepts such as working hard (17.5%), doing research (11.2%), enjoyable (9.7%), innovation (10.8%) and fun (5.5%). In generally, it was seen that children associated science with positive concepts and had a traditional point of view. Some studies (Hastürk Öztürk, Demir & Kartal, 2014) supported these findings. Hastürk Öztürk, Demir and Kartal (2014)

studied children's point of view about the nature of science and asked 50 children "What is science?" 40% of the children from primary school described science as "searching for the unknowns of the world and the universe, discovering new things and how they work" while 48% of the children from secondary school said "finding and using the essential knowledge to make this world a better place to live (e.g. treating diseases, solving the problem of pollution and improving agriculture)". Güler and Akman (2006) asked six years old childre about the science and most of them do not know the answer or do not seem to respond at all. Respondents defined science as knowing everything, formulas, compounds, potions, technology and inventions, experimenting, researching and studying, and the work of spacemen, engineers, doctors and professors. Based on both research and previous researchs, it is seen that the common points of understanding such as researching for science, discovering things and making discoveries are common to children.

Some changes were observed in the responses of participant children following the education program. They mostly associated science with the concepts of fun (21.1%), enjoyable (17.4%) and working hard (16.7%) after the education program. Metin and Leblebicioğlu (2011) found that children's views about science reached a more scientific level thanks to the science camp for children and they gained more detailed knowledge related to the scientific processes. Providing science education in a way different from the traditional approach, offering children opportunities to learn by doing and enabling their active participation all cause changes in children's views about science. Activities designed within this framework are considered fun and enjoyable by children. It is believed that science education will make this impact providing that it be supported with materials and experiences that arouse children's curiosity and encourage their active participation.

Analysis of the future job choices of participating children indicated that 27.2% of them preferred to be a police officer and 25.3% a teacher prior to the education. Nevertheless, following the education, an increase was observed in the percentage of the children who wanted to be an engineer (23.6%), especially a significant increase was seen in the number of children who preferred to be a scientist (100%) and those preferring to be a doctor (50%). The number of children preferring to be a teacher and police officer declined. Though there are many approaches related to job choices of children, it is usually stressed that these choices are largely affected by the family, personal traits of the child, the existing social structure, economic conditions, policies and education (Yaylacı, 2007). At this point, the activities children participated in and the education and opportunities offered to them are considered to expand their area of interest. Children's experiences and the models provided to them became important and the differences at various levels were observed in the job choices they made before and after the education program.

The distribution of children's responses regarding whether to be a scientist in the future indicated a positive increase in their desire to be a scientist in the future after they completed the science education program. This is thought to be resulting from the fact that children have lack of information or misinformation or they have no information at all about scientists, as none of the children thought of being a scientist prior to the science education. Can (2008) investigated children's views about scientists in a sample of 60 seventh grade students and discovered that during the pre-interview children in the control and experimental groups described the scientist as a person who is engaged in science and comes up with inventions. Previous research carried out with children found that children described the scientist as a person who knows how to attain scientific knowledge to make an invention. Besides describing the scientist, children were also asked to simply draw a scientist and a great majority of them depicted the scientist as a man. The female scientists were depicted as a well-groomed woman wearing a skirt and glasses whereas male scientists were depicted as an elderly man with an unkempt appearance and hair or a bald man with a goatee working in a laboratory full of chemical materials and test tubes. A large number of studies have also been conducted in Turkey to investigate the images of scientist of children across various grade levels, and similar results were obtained in these studies (Buldu, 2006; Cheng, 2013, Doğan & Öcal, 2008; Güler & Akman, 2006; Kaya, Doğan and Öcal, 2008); Korkmaz & Kavak, 2010; Oğuz-Ünver, 2010; Öcal, 2007; Yontar Toğrol, 2000). It is believed that accurate and explanatory information provided to children on areas of work-life affected children's job preferences and the science education program influenced children's career plans because it also changed their stereotypical image of scientist – a man wearing a white coat and working in a laboratory.

A majority of children (%90) responded "yes" when they were asked whether they wanted to participate again in the science education program. Children would like to be in the environments in which they feel enjoyment and therefore show active participation. Children's science centres and children's universities are established as it is considered important to introduce these environments to children in universities. Traditional approach maintains its existence in every stage of education including universities. It is emphasized that children's universities take on central roles in combining modern point of view with education and putting it into practice (Dworsky, 2015). Children universities are the places which provide children with a service within the scope of mass education, equip children with academic knowledge, give them a chance to share with the academics and help them understand the academic point of view. In children's universities, children are firstly offered with hands-on activities and then researches are conducted on the academic outputs, that is, the results of these hands-on activities. In these universities, it is intended to offer children a free thinking environment, opportunities to improve their skills especially their critical thinking and creativity skills, and an in-depth content in the areas such as astronomy, archelogy and life sciences, which are not covered within the mainstream education (Aydın, 2015). As the science education provided to children involves scientific and hands-on practices that require active participation and focus on reasoning and scientific literacy, they have a prominent place in children's desire to participate in these kinds of educational programs again (Cheng, 2013). Here, it is thought that these sorts of activities increase children's interest and desire to participate, as they are characteristically different from those included in the mainstream education.

Conclusion and Recommendations

This study was carried out in the city centre of Ankara within the scope of the project "Science Meets with Children at University", which was run at Ankara University with the support of Ankara Development Agency. The purpose of the study was to investigate whether children's perceptions of science and scientists changed and whether the education provided to children affected their future job choices.

The findings of the study is limited to;

- The children who participated in the science education within the scope of the project "Science Meets with Children at University"
- The data from the "Questionnaire of Views on Science and the Scientist" administered to the children participated in the project.

4688 children were provided with a science education within the scope of the project. 50.1% of the children were female while 49.9% were male and the majority of children (52.8%) were comprised of three and fourth grade students.

It was seen that 44.9% of the children thought that they would do a class (using traditional method) prior to the science education. Regarding the purpose of the education, the responses given by the children prior to and following the education program indicated that more than half of the children were expecting to explore a scientific discipline (51.0%) and the fun side of science (54.2%). Following the education, 63.6% of the participants described the purpose of education as finding out about a scientific discipline while 74.2% stated that the purpose of the education was to explore the fun side of science. It was found that there was a change in the percentages before and after the education program, with an increase in the positive views.

Children's views on the science-related concepts revealed that %19.4 of the children found science too hard, 5.5 % of them saw it as fun prior to the education. On the other hand, following the education children found science %21.1 fun and % 2.6 boring.

27.2% of the children preferred to be a police officer and 25.3% said they wanted to be a teacher prior to the education. However, following the education, an increase was observed in the percentage of the children who wanted to be an engineer (23.6%), especially a significant increase was seen in the number of children who preferred to be a scientist (100%) and those preferring to be a doctor (50%). The number of children preferring to be a teacher and police officer declined. None of the children preferred to be a biolog before

education but after 153 of them decide to be a biolog. Analysis of the future job choices of participating children showed that they mostly preferred to be a police officer and a teacher prior to the education. Nevertheless, following the education program, an increase was observed in the percentage of the children who wanted to be an engineer, a scientist or a doctor. None of the children preferred to be a scientist before the education, yet 306 children expressed that they would be a scientist in the future after they completed the education program.

Analysis of children's responses whether they would like to be a scientist in the future indicated an increase in their responses in relation to being a scientist after the education, when compared to their answers prior to the science education program. Children's responses regarding whether they would like to take part again in the education program showed that a large proportion of children (90.1%) said they would like to do so.

A general overview of the study results showed that there were differences between the views children shared before and after the science education program. It was observed that children's perceptions of science and scientists and their opinions on science-related concepts changed positively following the education; 72.6% of the children stated that they would like to participate again in a science education program and work in the area of science in the future. It was seen that the science education program had a positive effect on children.

Science education programs are changing children's views about science and scientists. Especially when it is considered that there are negative prejudices about science in our country and science education programs are important for breaking these negative prejudices and developing positive attitudes towards science from an early age. On the other hand, it is important for the students who study in the regions with low socio-economic level to meet with the scientists and scientists through the universities from an early age.

Arrangements can be made in the course contents provided in different grade levels with the purpose of popularizing science and science education and arousing awareness among children. Pre-schoolers and school age children can be encouraged to have an interest in science and involve in scientific activities by letting them explore the fun side of education using a variety of activities and games.

The importance of science education in early childhood can be emphasized through courses such as "Science", "Science and Child" and "Science Education with Children" in undergraduate and postgraduate programs of the universities that train teachers or other professionals who work with children.

Beginning from early childhood, children can be offered chances to make observations in university settings, engage in various activities and learn about science and the scientists by getting in contact with real scientists in order to improve the communication and achieve an increased integration between universities and the society. Besides universities, these studies can also be carried out in research and development centres, non-governmental organizations and various state institutions and organizations. Municipalities, which are mainly responsible for delivering service to the community, providing cultural, arts, educational and social opportunities to the people living in their boundaries and improving the standards in these areas, can make significant contributions by hosting and giving support for these kinds of educational activities. Furthermore, faculty and staff members from universities can build an awareness of science and scientists by visiting schools, especially those with inadequate conditions, and performing different activities with children.

The sexist point of view can be overcome by making arrangements in course contents, education materials and print and visual media and emphasizing that science and some professions are not only for men but also for women and a scientist can be a women as well as a man.

References

Akgündüz, D., Aydeniz, M., Çakmakçı, G., Çavaş, B., Çorlu, M. S., Öner, T. & Özdemir, S. (2015). *STEM eğitimi Türkiye raporu.* İstanbul: Scala Basım.

Aydede, M. N. & Kesercioğlu, T. (2012). The effect of active learning applications on the students' self-directed learning skills. *HU Journal of Education*, 43, 37-49.

Aydın, M. (2015). *Açılış Konuşmaları*, In A. Kaplan Sayı, Z. Topçu, T. G. Medet, Ç. Özdemir (Eds.), Avrupa ve Türkiye'de Çocuk Üniversiteleri Raporu. Retrieved from https://www.aydin.edu.tr/belgeler/CocukUniversitesiRaporu.pdf

Bamberger, Y. & Tal, T. (2007). Learning in a personal context: Levels of choice in a free choice learning environment in science and natural history museums. *Science Education*, *91*(1), 75-95.

Bathgate, M. E., Schunn, C. D. & Correnti, R. (2014). Children's motivation toward science across contexts, manner of interaction, and topic. *Science Education*, *98*(2), 189-215.

Bathgate, M. E., Schunn, C. D. & Correnti, R. (2014). Children's motivation toward science across contexts, manner of interaction, and topic. *Science Education*, *98*(2), 189-215.

Bilek, M. (2010). Natural science education in the time of virtual worlds. *Journal of Baltic Science Education*, *9* (1), 4-5.

Buldu, M. (2006). Young children's perceptions of scientists: a preliminary study. *Educational Research*, *48*(1), 121-132.

Büyüktaşkapu, S. (2010). *Bilimsel Süreç Becerileri*. In: B. Akman, G., Uyanık Balat, T. Güler (Eds.), Okul Öncesi Dönemde Fen Eğitimi (19-62). Ankara: PegemAkademi.

Can, B. (2008). *İlköğretim öğrencilerinin bilimin doğası ile ilgili anlayışlarını etkileyen faktörler* (Yayınlanmamış doktora tezi). Dokuz Eylül Üniversitesi, İzmir.

Charlesworth, R. & Lind, K. K. (2013). Math and science for young children. (7. Ed.). Belmont: Wadsworth Cengage Learning.

Cheng, H. (2013). What can we learn from Chinese and Australian primary school students' perceptions of scientists and science learning. In: C. Redman (Ed.), Successful Science Education Practices: Exploring What, Why and How They Worked (pp. 39-70). New York: Nova Science Publishers.

Çalışkan, H. & Turan, R. (2010). Sosyal bilgiler dersinde araştırmaya dayalı öğrenme yaklaşımının derse yönelik tutuma etkisi. *İlköğretim Online*, *9* (3), 1238-1250.

Danilov, V. J. (2010). *Hands-on science centers: a directory of interactive museums and sites in the United States*. McFarland.

Demir, N. & Akarsu, B. (2013). Ortaokul öğrencilerinin bilimin doğası hakkındaki algıları. *Journal of European Education*, *3*(1), 1-9.

Doğan Bora, N., Arslan, O. & Çakıroğlu, J. (2006). Lise öğrencilerinin bilim ve bilim insani hakkındaki görüşleri. *Hacettepe Eğitim Fakültesi Dergisi*, *31*(31), 32-44.

Driver, R. & Easley, J. (1978). Pupils and paradigms: Areview of literature related to concept development in adolescent science students. *Studies in Science Education, 5*(1), 61-84.

Duschl, R. A., Schweingruber, H. A. & Shouse, A. W. (2007). *Taking science to school: Learning and teaching science in grades K-8.* Washington D.C.: National Academies Press.

Dworsky, C. (2015). Çocuk Üniversitesi Nedir?. In: A. Kaplan Sayı, Z. Topçu, T. G. Medet, Ç. Özdemir (Eds.), Avrupa ve Türkiye'de Çocuk Üniversiteleri Raporu. Retrieved from https://www.aydin.edu.tr/belgeler/CocukUniversitesiRaporu.pdf

Eshach, H. & Fried, M. N. (2005). Should science be taught in early childhood? *Journal of science education and technology*, *14*(3), 315-336.

Güler, T. & Akman, B. (2006). 6 yaş çocuklarının bilim ve bilim insanı hakkındaki görüşleri. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 31*(31), 55-56.

Hastürk, H. G., Öztürk, N., Demir, R. & Kartal, T. (2012). Farklı eğitim kademelerinde öğrenim gören

öğrencilerin bilimin doğası ile ilgili görüşleri. *Tarih Okulu Dergisi*, *7* (18), 671-688.

Havu-Nuutinen, S. & Ahtee, M. (2007). Teaching and learning science in primary school. In *How Finns Learn Mathematics and Science* (229-242). Brill Sense.

Holmes, R. M., Liden, S. & Shin, L. (2013). Children's thinking styles, play, and academic performance. *American Journal of Play*, *5*(2), 219-238.

Howes, E. V. (2008). Educative experiences and early childhood science education: A Deweyan perspective on learning to observe. *Teaching and teacher education*, *24*(3), 536-549.

James, C. (2013). Dot drawing in science education: Making learning visible. In: C. Redman (Ed.), Successful science education practices: Exploring what, why and how they worked (pp. 183-202). New York: Nova Science Publishers.

Jurow, A. S. & Creighton, L. (2005). Improvisational science discourse: Teaching science in two K-1 classrooms. *Linguistics and Education*, *16*(3), 275-297.

Kandır, A., Yaşar, M. C., İnal, G., Yazıcı, E., Uyanık, Ö. & Yazıcı, Z. (2012). *Etkinliklerle bilim eğitimi.* Ankara: Efil Yayınevi.

Kaya, O. N., Doğan, A. & Öcal, E. (2008). Turkish elementary school students' images of scientists. *Eurasian Journal of Educational Research*, *32*, 83-100.

Klahr, D., Zimmerman, C. & Jirout, J. (2011). Educational interventions to advance children's scientific thinking. *Science*, *333*(6045), 971-975.

Korkmaz, H. & Kavak, G. (2010). İlköğretim öğrencilerinin bilime ve bilim insanına yönelik imajları. *İlköğretim Online*, *9*(3), 1055-1079.

Kuhn, D. (1993). Science as argument: Implications for teaching and learning scientific thinking. *Science education*, *77*(3), 319-337.

Kuhn, D. & Pearsall, S. (2000). Developmental origins of scientific thinking. *Journal of Cognition and Development*, *1*(1), 113-129.

Lind, K. K. (2001). *Science in the early childhood years.* The National Head Start Child Development Institute (CDI). July 10, 2016 Retrieved from http://www.hsnrc.org/cdi/klind1.cfm

Luce, M. R. & Hsi, S. (2015). Science-relevant curiosity expression and interest in science: an exploratory study. *Science Education*, *99*(1), 70-97.

Metin, D., & Leblebicioğlu, G. (2015). *Ortaokul 6. ve 7. sınıf öğrencilerinin bilimsel model ve modelleme hakkındaki görüşlerinin bir yaz bilim kampı süresince gelişimi*. *Eğitim ve Bilim*, *40*(177), 1-18.

Odell, M. R. I. Hewett, P., Bowan, J. & Boone, W. J. (1993). *Stereotypical Images of Scientist: A Cross.Age Study*. Paper Presented at the 41st annual National Meeting of the National Science Teachers Association, Kansas City, MO.

Oğuz Ünver, A. (2010). *Perceptions of scientists: A comparative study of fifth graders and fourth year student teachers.* Necatibey Eğitim Fakültesi Elektronik Fen ve Matematik Eğitimi Dergisi, *4*(1), 11-28.

Osborne, J. & Dillon, J. (2008). *Science education in Europe: Critical reflections* (Vol. 13). London: The Nuffield Foundation.

Ozdogan Ozbal, E. & Aral, N. (2015). Role of Universities in Science Education, Education in the 21st Century Theory and Practice. Prof. Dr. Irina Koleva, Prof. Dr. Emin Atasoy, Prof. Dr. Recep Efe,Assoc. Prof. Dr. Zdravka Blagoeva Kostova (Ed.), ISBN:978-954-07-4000-3, St. Kliment Ohridski Unıversıty Press, Bulgaria.

Öcal, E. (2007). *İlköğretim 6, 7, 8. sınıf öğrencilerinin bilim insanı hakkındaki imaj ve görüşlerinin belirlenmesi*.

(Yayımlanmamış yüksek lisans tezi). Gazi Üniversitesi, Ankara.

Peters, J. M. & Stout, D. L. (2006). *Science in elementary education, methods, concepts and inquiries* (10. Ed.). New Jersey: Pearson Prentice Hall.

Shaby, N., Assaraf, O. B. Z. & Tishler, C. E. (2016). The goals of science museums in the eyes of museum pedagogical staff. *Learning Environments Research*, *19*(3), 359-382.

Siry, C. A. & Lang, D. E. (2010). Creating participatory discourse for teaching and research in early childhood science. *Journal of Science Teacher Education*, *21*(2), 149-160.

Siry, C. & Kremer, I. (2011). Children explain the rainbow: Using young children's ideas to guide science curricula. *Journal of Science Education and Technology*, *20*(5), 643.

Şahin, F. (2000). *Okul öncesinde fen bilgisi öğretimi ve aktivite örnekleri.* İstanbul: Ya-Pa Yayın.

Tscholl, M. & Lindgren, R. (2016). Designing for learning conversations: How parents support children's science Learning within an immersive simulation. *Science Education*, *100*(5), 877-902.

Turkish Academy of Sciences (Türkiye Bilimler Akademisi) (2013). *Bilim Eğitimi Programı*, 02.02.2016 tarihinde http://www.tuba.gov.tr/content/toplanti-tutanagi/id/245/pid/96/mid/103 adresinden erişildi.

Uyanık Balat, G. (2010). Fen Nedir ve Çocuklar Feni Nasıl Öğrenir? B. Akman, G., Uyanık Balat, T. Güler (Eds.), Okul Öncesi Dönemde Fen Eğitimi (1-18) içinde. Ankara: PegemAkademi.

Yaylacı, G. Ö. (2007). *İlköğretim düzeyinde kariyer eğitimi ve danışmanlığı.* Türk Dünyası Sosyal Bilimler Dergisi (Bilig), 40, 119-140.

Yontar Toğrol, A. (2000). *Öğrencilerin bilim insanı ile ilgili imgeleri*. Eğitim ve Bilim, *25*(118), 49-57.

Yoon, J. & Onchwari, J. A. (2006). Teaching young children science: Three key points. *Early Childhood Education Journal*, *33*(6), 419-423.

Zimmerman, C. (2000). The development of scientific reasoning skills. *Developmental Review*, *20*(1), 99-149.