Elementary School Students' Attitudes Towards Science: Kutahya Sample[1]

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ABSTRACT

The aim of present research is to examine whether the attitudes of elementary school students towards science are varied according to certain variables. Survey model was used in the study and cluster sampling strategy was utilized to recruit participants. The total of 1041 elementary school students were participants in this research. Science and Technology Course Attitude Scale (Yaşar, & Anagün, 2008) was used to collect data. It was seen that the data did not spread of the normal distribution and that the non-parametric techniques could be used. For this, in the analysis of the research data, the Mann-Whitney U test was used for frequency, percentage, arithmetic average, paired comparison among the groups, and the Kruskal-Wallis test for multiple comparisons. The level of significance in the analysis of the data was accepted as .05. The results showed that the elementary school students have positive attitudes towards science. Female students, students from urban schools, and students that want to occupy in science related jobs in their future have significantly higher scores than their counter peers. Moreover, the scores differed significantly as the students' families' income and their education level increases.

Key Words: Science, Science education, Attitudes toward science, Elementary school students

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INTRODUCTION

Scientific literacy is the main purpose of science teaching (Aikenhead, 1990; American Association for the Advancement of Science [AAAS], 1993; Bybee, 1997). While there is no single agreed-upon definition of scientific literacy (Bybee, 1997), science educators agree about making individuals gain this competence (AAAS, 1993). Science-literate individuals can understand the core concepts and principles of science, the correlation between science and humanities, and the differences between science and technology (Hodson, 2003). However, science education aims to make students gain scientific literacy by not only teaching them scientific information and the functioning of the scientific process, but also by directing their attitudes towards science throughout the learning process (AAAS, 1990). In this case, it is seen that also in our country the applied or practiced science curriculums in the last decade, have included the field of affective learning and the matter of attitude under this learning field (Ministry of National Education, [MoNE], 2005; 2006; 2013; 2017).

The attitudes towards the field of science can be simply defined as whether individuals like or dislike science (Yaşar, & Anagün, 2008). When examined thoroughly, the science attitudes can be accepted as cognitive and affective dimensions that are effective in the development of scientific literacy while learning, approaching, and distributing scientific information (Hand, Prain, Lawrence, & Yore, 1999). The cognitive dimension includes having a scientific understanding, being able to do a scientific research, and reasoning. The affective dimension is to create positive attitudes towards scientific topics and implementation (Wu et al., 2012). In addition to this, the interests in science, attitudes towards scientists, and features like sense of social responsibility about scientific topics are also associated with the affective dimension of scientific literacy (Lee, & Erdogan, 2007).

It is, in many ways, one of the desired outcomes of education for students to have positive attitudes towards science. The positive attitudes would influence the career choices of students in the fields of science, technology, engineering, and mathematics (Karahan, Canbazoğlu Bilici, & Ünal, 2015). It is also important to develop attitudes towards science to create a public that is knowledgeable about scientific topics, and raise science-literate citizens who appreciate the value of science (Hillman, Zeeman, Tilburg, & List, 2012; National Research Council [NRC], 2012). Moreover, the factors that influence scientific process skills, include also the attitudes towards science (Demir, 2007).

When the literature is examined, it is seen that attitudes towards science are affected by school level (Genç, 2001; Tereci, Aydın, & Orbay, 2008), gender (Altınok, 2005; Chetcuti, & Kioko, 2012), achievement (Altınok, 2005), learning styles (Azizoğlu, & Çetin, 2009), socio-economic level and academic degrees of parents (Hazır Bıkmaz, 2001; Serin, Kesercioğlu, Saracaloğlu, & Serin, 2003; Yılmaz, 2006; Akgün, Aydın, & Sünkür, 2007; Ekinci, 2011). However, it is hard to indicate that there is a coherent correlation between these variants and the attitudes towards science.

It is believed that one of the most important variants that influence the attitudes towards science is gender. The researches that were conducted by Chetcuti and Kioko (2012), Hong and Lin (2011), and Tekbıyık and İpek (2007) show that the attitudes of girls towards science are higher than boys. On the other hand, some other studies in the literature (see Akgün et al., 2007; Azizoğlu, & Çetin, 2009; Cherian, & Shumba, 2011; Smith, Pasero, & McKenna, 2014) report that the attitude scores of male students are higher than female students'. In addition to this, the researches of Altınok (2005), Erden (2007), Genç (2001), Hazır

Bıkmaz (2001), Kaya and Böyük (2011), Külçe (2005), Tereci et al., (2008), Turhan, Aydoğdu, Şensoy and Yıldırım (2008) detected no correlation between gender and attitudes towards science. As you can see, it cannot be stated that there is a coherent correlation between the variant of gender and the attitudes towards science.

Schools, families, and social factors also influence students' attitudes towards science. Socioeconomic level of parents is in direct proportion to their student's attitude towards science. As the economic status of parents increases, so does their child's attitude towards science (Hazır Bıkmaz, 2001; Serin et al., 2003; Akgün et al., 2007). Parents should care about their child's lessons, encourage and help them when they can for children to develop positive attitudes. Yet parents' interest in their child's education is closely related to their economic status and academic degrees. The students whose parents are well-educated and have a high economic status, have more positive attitudes (Yılmaz, 2006; Ekinci, 2011). In addition, where the student lives, in a village or city, influences their attitudes towards science (Serin et al., 2003; Chetcuti, & Kioko, 2012).

There are studies in the literature with different samples on attitudes towards science. Some studies that examined the attitudes of teachers (Ekici, 2002b; van Aalderen-Smeets, & van der Molen, 2013), teacher candidates (Türkmen, 2002; Serin, Serin, & Kesercioğlu, 2005; Çamlıbel Çakmak, 2006; Kızılcık, Temiz, Tan, & İngeç, 2010; Can, & Şahin, 2015), and secondary and high-school students (Berberoğlu, 1990; Ekici, 2002a; Altınok, 2005; Kozcu Çakır, Şenler, & Göçmen Taşkın, 2007; Turhan et al., 2008) towards science. Although science education begins in elementary school years most of the related studies are focused on secondary or high-school students' attitudes towards science. In another word, the number of studies that examine the attitudes of elementary school students towards science is limited (see Eren, Karadeniz Bayrak, & Benzer, 2015). On the other hand, the period on which students have the highest interest in science is when they first meet science– in elementary school. The attitudes and value judgements of students towards science are formed on this period. For this, it can be said that the attitudes of students which are formed in elementary school level, are one of the fundamental variants that play a role in their science learning (Tekbıyık, & İpek, 2007). Measuring attitudes during teaching-learning process, making a prediction about their future acts by determining learners' attitudes in a particular time frame, altering their attitudes or making them gain new attitudes are all helpful in realizing learners' already-existing choices (Nuhoğlu, 2008). Within this frame, the aim of this research is to analyze the attitudes of 4th-grade students in elementary school towards science. In the search for this purpose, the following questions were asked:

- What is the level of students' attitudes towards science?
- Do the attitudes of students towards science change according to their genders, general achievement levels, science achievement levels, parents' income levels, mothers' academic degrees, fathers' academic degrees, ideal future professions, and the learning periods they study with their teachers?

METHOD

Research Model

A survey model (Karasar, 1994) was used in the research. The survey model was conducted by the researchers for it provides (i) a quantitative description of the population's attitudes towards science, through the studies done on a sample selected from the Kütahya population, and (ii) an inference about the population via the information obtained from the population.

Population and Sample

The central elementary schools (public and private) affiliated with the Kütahya Provincial Directorate of National Education, the village elementary schools that are affiliated with the central ones, and the students who are at the 4th-grade constitute the population of this research. Since it is not possible to approach the entire population in terms of time and cost, sampling from the population was preferred. For this purpose, the cluster sampling strategy (Karasar, 1994) was used in determining the study group. The cluster sampling is not a process that individuals are sampled but they are sampled as groups (Kaptan, 1998). Each cluster in the population with its all members has an equal possibility to be selected (Karasar, 1994). Within the framework of the research, each elementary school in Kütahya city centre and the village elementary schools that are affiliated with the center were accepted as a cluster. In this case, 25 schools in the academic year of 2015-2016 constituted the clusters.

Among the cluster sampling approaches, the disproportionate sampling approach was used in the research. In this approach, all the clusters within the population has the equal possibility to be selected through a simple and random sampling method. In another word, with the disproportionate sampling approach, the number of those who got into the sampling from each cluster of the population was completely by chance (Karasar, 1994). Thus 25 elementary schools were determined randomly to undertake the implementation of the research. 1041 elementary school students from these schools constituted the study group of the research.

48.8% of the students that participated in the research were girls and 51.1% were boys. In terms of grade point average of the previous semester, 1.8% of the students resulted in 0-44 points, 2.9% in 45-54, 6.0% in 55-69, 21.7% in 70-84, and 64.5% in 85-100 points. In addition, it was determined that in terms of science grades, 1.7% of the students who participated in the research resulted in 0-44 points, 4.1% in 45-54, 5.3% in 55-69, 18.7% in 70-84, and 66.0% in 85-100 points. In terms of family income level, it was stated that 36.5% of the students had 0-1300TL, 26.2% 1301-2600TL, 14.1% 2601-3900TL, 8.4% 3901-5200TL, and 7.1% 5201TL or over monthly income. The research showed that 38.9% of the students' mothers were illiterate or elementary school graduates, 23.2% were secondary-school, 19.6% were high-school, and 13.0% were university graduates. The research also showed that 19.7% of the students' fathers were illiterate or elementary school graduates, 20.0% were secondary-school, 29.9% were high-school, and 24.4% were university graduates. 52.3% of their ideal future professions were the professions that are related with science and 45.5% were other professions. In terms of studying with their teachers, it was determined that 23.6% of the students did not have a different teacher for 1 year, 15.5% for 2 years, 11.8% for 3 years, and 47.6% for 4 years. Lastly, 24.7% of the students attended village schools and 75.3% attended urban schools.

Data Collection Tool

To measure the students' attitudes the Science and Technology Attitude Scale (Yaşar & Anagün, 2008) was used. Suitability of the data to the factor analysis was examined through Kaiser-Meyer-Olkin (KMO) coefficient and Barlett Sphericity's test. KMO coefficient is a statistical method that is used in detecting whether the data and sample scale are suitable and adequate for the selected analysis. As a result of the analysis, KMO value was obtained as 0.93. Barlett Sphericity's test is a statistical technique that can be used in controlling whether the data is generated from a multivariate normal distribution. The statistical significance of the chi-square test obtained as a result of this test, is an indication that the data was generated from a multivariate normal distribution. As a result of the analysis carried out in the research, Barlett's test was found significant (χ2=5613,063; p<0.01). All these results revealed that the data was suitable for factor analysis. As a result of the factor analysis, it was observed that the scale was based on three factors. Regarding to the literature, the factors were named *enjoyment, learning wish* and *personal views toward science* based on literature. Thus, the Science and Technology Attitude Scale is consisted of 19 articles and three factors. Cronbach's Alpha reliability coefficient was calculated for that the internal consistency of the relevant scale was to be determined and the value was found .89 (Yaşar, & Anagün, 2008). The Cronbach's Alpha reliability coefficient of the scale was calculated thanks to the data gathered within the framework of the present study, and the reliability coefficient was calculated as .85. Tekin (2000) states that the reliability coefficient varies between (0.00) and (+1,00), and that it is almost impossible to develop tests that are of (+1.00) reliability in education and psychology. The .85 value obtained in this case is accepted as adequate.

Data Analysis

The normal distribution of the scores was examined to determine which statistical analysis technique to use first, within the scope of the data obtained in the research. In this case, the coefficients of skewness and kurtosis, histogram of normal distribution curve, Q-Q Plot graph, and boxplot were examined, and Kolmogorov-Smirnov value (Büyüköztürk, Çokluk, & Köklü, 2012) was calculated. It was seen that the data did not spread of the normal distribution and that the non-parametric techniques could be used. For this, in the analysis of the research data, the Mann-Whitney U test was used for frequency, percentage, arithmetic average, paired comparison among the groups, and the Kruskal-Wallis test for multiple comparisons. The level of significance in the analysis of the data was accepted as .05 (Büyüköztürk et al., 2012).

FINDINGS

Findings on the 4th-grade Students' Attitudes towards Science

The general distribution of the students' attitude scores towards science is shown in Table 1.

Table 1. *The general distribution of the students' attitude scores towards science*

(N)	*Minimum Score Received*	*Maximum Score Received*	*Arithmetic Mean*	*Sd*
1041	36	95	81.82	11.31

As seen in Table 1, the minimum score that the students who participated in the research received from the scale is 36, the maximum is 95. The standard deviation of the scores obtained is 11.31. And the arithmetic mean of the scores is 81.82. According to this average, it can be said that the attitudes of the 4th-grade students towards science lessons are generally high.

The Attitudes of 4th-grade Students towards Science in Terms of the Independent Variables

Whether the attitudes of 4th-grade students towards science change according to their genders, general achievement levels, science achievement levels, parents' income levels, mothers' academic degrees, fathers' academic degrees, ideal future professions, and the learning periods they study with their teachers were examined. The findings obtained are as follow.

The Attitudes of the Students According to Their Genders

Whether the 4th-grade students' attitude scores towards science show a significant difference according to their genders was examined with Mann-Whitney U test. The findings are shown in Table 2.

Table 2. *The results of Mann-Whitney U test on the students' attitude scores towards science according to their genders*

Gender	*n*	*Mean Rank*	*Sum of Ranks*	*U*	*P*
Female	508	541.09	274873.00	124669.000	.031
Male	532	500.84	266447.00		

When Table 2 is examined, it is seen that there is a significant difference in students' attitude scores towards science according to their genders (U=124669.000, p<.05). It provides that considering the mean ranks, the female students' attitude scores are higher than the male students. For this, it can be stated that the female students have more positive attitudes towards science than the male students.

The Attitudes of the Students According to the Location of the Schools They Attend

Whether the 4th-grade students' attitude scores towards science show a significant difference according to the location of the schools that they attend was examined using the Mann-Whitney U test. The findings are shown in Table 3.

Table 3. *The results of Mann-Whitney U test on the students' attitude scores towards science according to their school locations*

School Locations	*n*	*Mean Rank*	*Sum of Ranks*	*U*	*p*
Village	257	445.66	114535.50	81382.500	.000
City Centre	784	545.70	427825.50		

When Table 3 is examined, it is seen that there is a significant difference in students' attitude scores towards science according to where their schools are located – in a village or in the urban area (U=81382.500, p<.05). It provides that considering the mean ranks, the attitude scores of the students from urban schools are higher than those from village schools. For this,

it can be stated that the students from urban schools have more positive attitudes towards science than the ones from village schools.

The Attitudes of the Students According to their General Achievement Levels

The Kruskal-Wallis test results on whether the attitude scores of the 4th-grade students towards science show a significant difference according to their general achievement levels are shown in Table 4.

Table 4. *The Kruskal-Wallis test results on the attitude scores of the students towards science according to their grade point averages*

Grade Point Average	*N*	*Mean Rank*	*Sd*	χ^2	*p*	*Significant Difference*
1) 0-44	19	171,34	4	220,24	.000	1-4, 1-5, 2-4, 2-5, 3-4, 3-5, 4-5
2) 45-54	30	239,30				
3) 55-69	62	247,36				
4) 70-84	226	363,02				
5) 85-100	671	597,20				

The analysis results in Table 4 reveal that there is a significant difference in students' attitude scores towards science according to their previous semester grade point averages [$\chi^2(2)=220.24$, $p<.05$]. It is seen that considering the mean ranks of the groups, the students with the highest scores are the ones whose grade point averages from the previous semester were 85-100, and that they are followed by the students with 70-84 grade point averages. The lowest scores are of those with 0-44 grade point averages. In this context, using the Mann-Whitney U test, the sources of the difference among the groups were examined. As a result of this examination, it was found that the students with a grade point average of 0-44 had significantly lower attitude scores towards science than those with a score of 70-84 and 85-100. It was also observed that the students with a grade point average of 45-54 had a significantly lower attitude scores in science than the students who scored 70-84 and 85-100 points. On the other hand, the attitude scores of the students with a grade point average of 55-69 are significantly lower than the students with a grade point average of 70-84 and 85-100. And the scores of the students with a grade point average of 70-84 are significantly lower than the ones with a grade point average of 85-100. Within these findings, it can be stated that students with a higher-grade point average have more positive attitudes towards science.

The Attitudes of the Students towards Science According to Their Science Grades

Table 5 shows the Kruskal-Wallis test results on whether the elementary school students' attitude scores towards science show a significant difference according to their science grades.

Table 5. *The Kruskal-Wallis test results on the students' attitude scores towards science according to their science grades*

Science Grade	*N*	*Mean Rank*	*Sd*	χ^2	*p*	*Significant Difference*
1) 0-44	18	193.92	4	221.47	.000	1-4, 1-5,
2) 45-54	43	186.07				2-3, 2-4, 2-5,
3) 55-69	55	286.93				3-5,
4) 70-84	195	345.95				4-5
5) 85-100	687	587.94				

The analysis results reveal that there is a significant difference in students' attitude scores towards science according to their science grades [$\chi^2(2)=221,47$ $p<.05$]. Considering the mean ranks of the groups, the students with the highest scores are the ones with a science grade of 85-100, and that they are followed by the students with a science grade of 70-84. And the students who had the lowest scores had a grade of 45-54 points. In this context, using the Mann-Whitney U test, the sources of the difference among the groups were examined. As a result of this examination, it is seen that the students with a grade point average of 0-44 have a significantly lower attitude scores towards science than the ones with a grade point average of 70-84 and 85-100. It is also seen that the students with a grade point average of 45-54 have a significantly lower attitude scores towards science than the ones with a grade point average of 55-69, 70-84, and 85-100. The attitude scores of the students with a grade point average of 55-69 are significantly lower than the ones with a grade point average of 70-84. It is also seen that the attitude scores of the students with a grade point average of 70-84 are significantly lower than the ones with a grade point average of 85-100. Within these findings, it can be stated that the students who have a higher-grade point average have more positive attitudes towards science.

The Attitudes of the Students towards Science According to Their Parents' Incomes

Table 6 shows the Kruskal-Wallis test results on whether the elementary school students' attitude scores towards science show a significant difference according to their parents' incomes.

Table 6. *The Kruskal-Wallis test results on the students' attitude scores towards science according to their parents' incomes*

Income Level	*n*	*Mean Rank*	*sd*	χ^2	*p*	*Significant Difference*
1) 0-1300 TL	380	428.72	4	29.609	.000	1-2, 1-3
2) 1301-2600 TL	273	519.08				
3) 2601-3900 TL	380	557.70				
4) 3901-5200 TL	87	495.76				
5) 5201 TL or over	81	484.70				

The analysis results show that there is a significant difference in students' attitude scores towards science according to their parents' incomes [$\chi2(2)=29.609$, $p<.05$]. Considering the mean ranks of the groups, it is seen that the parents of the students with the highest scores have a 2601-3900 TL monthly income. The parents of the students who had the lowest scores have a 0-1300 TL monthly income. In this context, using the Mann-Whitney U test, the sources of the difference among the groups were examined. As a result of this examination, it is seen that the students whose parents have a 0-1300 TL monthly income have significantly lower

attitude scores towards science than the ones whose parents have a 1301-2600 TL and 2601-3900 TL monthly income. Within these findings, it can be stated that children of parents with a high-income level have more positive attitudes towards science.

The Attitudes of the Students towards Science According to Their Mothers' Academic Degrees

Table 7 shows the Kruskal-Wallis test results on whether the elementary school students' attitude scores towards science show a significant difference according to their mothers' academic degrees.

Table 7. *The Kruskal-Wallis test results on the students' attitude scores towards science according to their mothers' academic degrees*

Mothers' Academic Degrees	*n*	*Mean Rank*	*sd*	χ^2	*p*	*Significant Difference*
1) Elementary school or illiterate	405	438.42	3	47.765	.000	1-3, 1-4, 2-3, 2-4
2) Secondary-school	242	470.37				
3) High-school	204	555.74				
4) University	135	606.14				

The analysis results show that there is a significant difference in students' attitude scores towards science according to their mothers' academic degrees [$\chi^2(2)=47.765$, $p<.05$]. Considering the mean ranks of the groups, it is seen that the mothers of the students with the highest scores are university graduates and that is followed by the ones with high-and-secondary-school graduate mothers, respectively. The mothers of the students with the lowest scores are either illiterate or elementary school graduates. In this context, using the Mann-Whitney U test, the sources of the difference among the groups were examined. As a result of this examination, it is seen that the students whose mothers are illiterate or elementary school graduates have significantly lower attitude scores towards science than the others. Also, the students whose mothers are secondary-school graduates have significantly lower attitude scores towards science than the ones whose mothers are high-school or university graduates. Within these findings, it can be stated that the higher academic degree mothers have, the more positive attitudes students have towards science.

The Attitudes of the Students towards Science According to Their Fathers' Academic Degrees

Table 8 shows the Kruskal-Wallis test results on whether the elementary school students' attitude scores towards science show a significant difference according to their fathers' academic degrees.

Table 8. *The Kruskal-Wallis test results on the students' attitude scores towards science according to their fathers' academic degrees*

Fathers' Academic Degrees	*n*	*Mean Rank*	*sd*	χ^2	*p*	*Significant Difference*
1) Elementary school or illiterate	205	425.29	3	41.762	.000	1-3, 1-4, 2-4,
2) Secondary-school	208	448.41				3-4
3) High-school	311	484.74				
4) University	254	580.81				

The analysis results show that there is a significant difference in students' attitude scores towards science according to their fathers' academic degrees [$\chi^2(2)=41.762$, $p<.05$]. Considering the mean ranks of the groups, it is seen that the fathers of the students with the highest scores are university graduates and that is followed by the ones with high-and-secondary-school graduate fathers, respectively. The fathers of the students with the lowest scores are either illiterate or elementary school graduates. As a result of this examination, it is seen that the students whose fathers are illiterate or elementary school graduates have significantly lower attitude scores towards science than the others. The students whose fathers are secondary-school graduates have significantly lower attitude scores towards science than those whose fathers are college graduates. Also, the students whose fathers are high-school graduates have significantly lower attitude scores towards science than those whose fathers' college graduates. Within these findings, it can be stated that the higher academic degree fathers have, the more positive attitudes students have towards science.

The Attitudes of the Students towards Science According to Their Ideal Future Professions

Whether the 4th-grade students' attitude scores towards science show a significant difference according to their ideal future professions, was examined using the Mann-Whitney U test. The findings are shown in Table 9.

Table 9. *The results of Mann-Whitney U test on the students' attitude scores towards science according to their ideal future professions*

Profession Choice	*n*	*Mean Rank*	*Sum of Ranks*	*U*	*p*
Science	544	546.08	297067,00	109029,00	.00
Others	474	467.52	221604,00		

When Table 9 is examined, it is seen that there is a significant difference in students' attitude scores towards science according to their ideal future professions ($U=109029.00$, $p<.05$). Considering the mean ranks of the groups, it is seen that the attitude scores of the students who want to choose science as a profession are higher than the students who want to choose other professions. For this finding, it can be stated that the students who want to choose a profession in the science field have more positive attitudes towards science than the ones who want to choose another profession.

The Attitudes of the Students towards Science According to the Learning Periods They Spend with Their Teachers

Whether the 4th-grade students' attitude scores towards science show a significant difference according to the learning periods they spend with their teachers, was examined using the Kruskal-Wallis test. The findings are shown in Table 10.

Table 10. *The Kruskal-Wallis test results on the students' attitude scores towards science according to the learning periods they spend with their teachers*

Years	*n*	*Mean Rank*	*sd*	χ^2	*p*	*Significant Difference*
1	246	456.82	3	13.291	.004	1-2, 1-3, 1-4,
2	161	553.23				
3	123	538.98				
4	496	522.40				

The analysis results show that there is a significant difference in students' attitude scores towards science according to the learning periods they spend with their teachers [$\chi^2_{(2)}$=13.291, p<.05]. Considering the mean ranks of the groups, it is seen that the students with the highest scores are the ones that have been studying with their teachers for 2 years. That is followed by the students who have been studying with the same teacher for 3 and 4 years, respectively. The students with the lowest scores are the ones who study with the same teacher for 1 year. In this context, using the Mann-Whitney U test, the sources of the difference among the groups were examined. As a result of this examination, it is seen that the students who have had the same teacher for only 1 year have significantly lower attitude scores towards science than the ones that have studied with the same teacher for 2, 3 or 4 years. Within these findings, it can be stated that the students who have had the same teacher for only 1 year have lower positive attitudes towards science than others. In another word, the students who study with the same teacher for more than a year have more positive attitudes towards science.

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

Attitudes towards science influence career choices, citizenship adequacy, and academic achievement of students. For the emphasized importance of attitudes towards science, the attitudes of 4th-grade students towards science and the correlation between their attitudes and some variants were studied in this research. The research found out that the elementary school students had a positive attitude towards science. It is also reported by many other researches that the attitudes towards science is high. For example, Kozcu Çakır et al., (2007) studied on secondary school students and Türkmen (2002, 2008b) on teacher candidates and they also found out that the participants had high attitudes towards science. Although many developments that adversely influence human life such as global warming, nuclear disasters, cloning and epidemics are now science-based and associated with technological improvements, the fact that elementary school students have positive attitudes towards science can be regarded as a sign of their appreciation of the value of science and its importance in facilitating human life.

The research showed that the science attitudes of the students who attend urban schools are more positive than those who attend the rural schools. Serin et al. (2003) also reported that students in urban schools have higher positive attitudes towards science. In addition to this, there are some other research results in the literature as well. For example, Chetcuti and Kioko (2012) found out that the students who study in rural Kenya have more positive attitudes towards science. Türkmen (2002) found out that students from medium-sized cities have higher attitudes towards science than those from villages, towns or metropolitan cities. Eren et al. (2015) stated that there is no difference between the science attitudes of students who attend private schools and those who attend public schools. In different researches, it is seen that different results are obtained according to variants such as the place where students live

or the place of schools where students attend. Nevertheless, the reason for the high attitude scores of students who attend city center schools can be explained by lack of equal opportunity in education. Since Turkey is a developing country, a complete equal opportunity could not have been achieved among the education areas yet. There is no doubt that schools in rural areas are inadequate in terms of opportunities. Especially in schools in rural areas, there are no laboratories where students will experiment like scientists and enjoy using scientific method. This may explain the fact that the attitudes of students in rural schools towards science are relatively low.

It was determined in the research that the students with high grade point averages and high science grades had high attitudes towards science. As a matter of fact, in many studies, it is stated that attitudes of students towards science is one of the key factors affecting the students' science achievements. For example, Akgün et al. (2007) determined in their research that students with a high-grade point averages have high attitudes towards science. Altınok (2005) stated that attitudes of students towards science influence their achievement motives. In that context, she stated that there was no difference in terms of achievement motives between male and female students who had positive attitudes, yet achievement motives of male students who had negative attitudes were lower than female students. Ceylan and Berberoğlu (2007) they predicted in their modelling study that one of the four factors that influence students' science achievements is attitudes towards science. Also, it is seen that the higher attitudes of students towards science get, the lower the perception of failure gets (Ceylan, & Berberoğlu, 2007). However, Türkmen (2002) reported that there was no correlation between attitudes towards science and university placement test achievements of classroom teacher candidates.

The research showed that the female students had more positive attitudes towards science than the male students. Chetcuti and Kioko (2012), Hong and Lin (2011), and Tekbıyık and İpek (2007) also found out in their researches that girls have more positive attitudes towards science than boys. However, in the other researches in the literature (see Azizoğlu, & Çetin, 2009; Cherian, & Shumba, 2011; Smith et al., 2014), it is reported that male students have higher attitude scores than female students. On the other hand, Altınok (2005), Hazır Bıkmaz (2001), Eren et al. (2015), Erden (2007), Genç (2001), Kaya and Böyük (2011), Külçe (2005), and Tereci et al. (2008) did not state a correlation between gender and attitudes towards science. As you can see, there is no consistent correlation between gender and attitudes towards science in the literature. This may be caused by teachers or socio-cultural environments that students are in. For this, by in-depth interviewing with male and female student groups, whose attitudes towards science are statistically different, an examination of the reason that the correlation between attitudes towards science and the variant of gender differs could be undertaken.

As the research results show, the parents of students who had higher incomes had more positive attitudes towards science. Similarly, Hazır Bıkmaz (2001), and Serin et al. (2003) also found in their researches that students whose parents have a well economic status have higher attitude scores towards science. On the other hand, it was determined that the higher academic degrees parents have, the more positive attitudes students have towards science. This result of the research differs from some other researches in the literature such as Külçe (2005), Serin et al. (2003), and Tereci et al. (2007). In these studies, it was stated that attitudes of students towards science did not change statistically according to their parents' academic

degrees. Although there are researches in the literature which state different results on variants of parents' income levels and academic degrees, and attitudes towards science, it can be said that both income levels and academic degrees of parents are important variants in explaining attitudes towards science. Because parents' level of income is one of the key components of the individual's ability to receive extracurricular learning support and to enhance academic achievement. As a matter of fact, it is emphasized in the literature (see Azizoğlu, & Çetin, 2009; Erdem, Yılmaz, Atav, & Gücüm, 2004; Hong, & Lin, 2011) that there is a positive relationship between academic achievement and attitudes towards the course. Rice, Barth, Guadagno, Smith and Mccallum (2013) also note that children receiving support from their parents and friends for science lessons develop a more positive attitude towards science. As a student accomplishes a lesson, the self-perception develops positively and they develop positive affective behaviors towards the subject. On the other hand, high and qualified, educated parents have a role to facilitate their learning in their children's homework and out-of-school learning environments. They help children learn what they cannot learn for several reasons at school. Therefore, it can be said that the level of education of parents is meaningful related to the attitudes towards science.

It was seen that the students who have studied with the same teacher for 1 year have significantly lower attitude scores towards science than those who have studied with the same teacher for 2, 3, or 4 years. The time that teachers and students have been academically together may have influenced students' attitudes towards science in a positive way, as teachers plan their teaching-learning processes in accordance with individual differences and learning characteristics of students. Admittedly, teachers have a crucial role in creating and forming attitudes and thoughts of students towards science and scientists (Türkmen, 2008a). Therefore, teachers' thoughts and attitudes on science influence the opinions and attitudes of their students. Former researches show that teachers who lean towards science tend to influence their students' similar positive attitudes (Koch, 1990).

This research which examines the elementary school 4th-grader students' attitudes towards science, was conducted using a quantitative research approach. In this respect, the sample is limited to generalizing the results to the population of Turkey. Using the reasonable sampling strategies, the attitudes of elementary school students towards science throughout Turkey and the correlation between their attitudes and the related variants can be examined. It could be recommended to use mixed method studies to examine attitudes towards science. Lastly, attitudes towards science according to education levels may be examined by longitudinal studies. On that sense, it is thought that effective policies for implementation can be developed. In terms of implementation, it is proposed to plan activities that are aimed at improving the science attitudes of children with lower education levels, children living in villages and families with lower income levels.

REFERENCES

Aikenhead, G. S. (1990). Scientific/technological literacy, critical reasoning and classroom practice. In S. P. Norris, & L. M. Phillips (Eds.), *Foundations of literacy policy in Canada* (pp. 127–145). Calgary: Detselig Enterprises.

Akgün, A., Aydın, M., & Öner Sünkür, M. (2007). İlköğretim öğrencilerinin fen dersine yönelik tutumlarının çeşitli değişkenlere göre incelenmesi. *A. Ü Bayburt Eğitim Fakültesi Dergisi, 2*(2), 1-14.

Altınok, H. (2005). Cinsiyet ve başarı durumlarına göre ilköğretim 5. sınıf öğrencilerinin fen bilgisi dersine yönelik tutumları. *Eurasian Journal of Educational Research, 17,* 81-91.

American Association for the Advancement of Science. (1990). *Science for all Americans.* New York: Oxford University Press.

American Association for the Advancement of Science. (1993). *Science for all Americans: Project 2061.* New York: Oxford University Press.

Azizoğlu, N., & Çetin, G. (2009). 6. sınıf ve 7. sınıf öğrencilerinin öğrenme stilleri, fen dersine yönelik tutumları ve motivasyonları arasındaki ilişki. *Kastamonu Eğitim Dergisi, 17,* 171-182.

Berberoğlu, G. (1990). Kimyaya ilişkin tutumların ölçülmesi. *Eğitim ve Bilim, (14)*76, 16-27.

Büyüköztürk, Ş., Çokluk, Ö., & Köklü, N. (2012). *Sosyal bilimler için istatistik.* Ankara: Pegem Akademi.

Bybee, R. (1997). Toward an understanding of scientific literacy. In W. Graber, & C. Bolte (Eds.), *Scientific literacy* (pp. 37–68). Kiel: Institute for Science Education.

Can, M., & Şahin, Ç. (2015). Okul öncesi öğretmen adaylarının fene ve fen öğretimine yönelik tutumlarının incelenmesi. *Abant İzzet Baysal Üniversitesi Eğitim Fakültesi Dergisi, 15(2),* 13-26.

Ceylan, E., & Berberoğlu, G. (2007). Öğrencilerin fen başarısını açıklayan etmenler: Bir modelleme çalışması. *Eğitim ve Bilim, 32*(144), 36-48.

Cherian, L., & Shumba A. (2011). Sex differences in attitudes toward science among Northern Sotho speaking learners in South Africa. *Africa Education Review, 8(2),* 286-301.

Chetcuti, A. D., & Kioko, B. (2012) Girls' attitudes towards science in Kenya. *International Journal of Science Education, 34(10),* 1571-1589.

Çamlıbel-Çakmak, Ö. (2006). *Okul öncesi öğretmen adaylarının fene ve fen öğretimine yönelik tutumları ile bazı fen kavramlarını anlama düzeyleri arasındaki ilişkinin incelenmesi* (Yayımlanmamış yüksek lisans tezi). Abant İzzet Baysal Üniversitesi, Sosyal Bilimler Enstitüsü, Bolu.

Demir, M. (2007). *Sınıf öğretmeni adaylarının bilimsel süreç becerileriyle ilgili yeterliliklerini etkileyen faktörlerin belirlenmesi* (Yayımlanmamış doktora tezi). Gazi Üniversitesi Eğitim Bilimleri Enstitüsü, Ankara.

Ekici, G. (2002a). Biyoloji dersine yönelik tutum ölçeği. *Eğitim Araştırmaları, 8,* 136-143.

Ekici, G. (2002b). Biyoloji öğretmenlerinin laboratuvar dersine yönelik tutum ölçeği. *Hacettepe Üniversitesi Eğitim Dergisi, 22,* 62-66.

Ekinci, C. E. (2011). Bazı sosyoekonomik etmenlerin Türkiye'de yükseköğretime katılım üzerindeki etkileri. *Eğitim ve Bilim,* 36(160), 281-297.

Erdem, E., Yılmaz, A., Atav, E., & Gücüm, B. (2004). Öğrencilerin "madde" konusunu anlama düzeyleri, kavram yanılgıları, fen bilgisine karşı tutumları ve mantıksal düşünme düzeylerinin araştırılması. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, 27,* 74-82.

Erden, E. (2007). *Sınıf öğretmenlerinin fen öğretimi öz yeterlilik inançlarının öğrencilerin fen tutumları ve akademik başarıları üzerindeki etkisi* (Yayımlanmamış yüksek lisans tezi). Ege Üniversitesi Sosyal Bilimler Enstitüsü, İzmir.

Eren, C. D., Karadeniz Bayrak, B., & Benzer, E. (2015). The examination of elementary school students' attitudes toward science course and experiments in terms of some variables. *Procedia - Social and Behavioral Sciences*, *174*, 1006-1014.

Genç, M. (2001). *İlköğretim okullarının ikinci kademesindeki öğrencilerin fen bilgisi dersine karşı tutumlarının değerlendirilmesi* (Yayımlanmamış yüksek lisans tezi). Celal Bayar Üniversitesi Eğitim Bilimleri Enstitüsü, Manisa.

Hand, B., Prain, V., Lawrence, C., & Yore, L.D. (1999). A writing in science framework designed to enhance science literacy. *International Journal of Science Education, 21*(10), 1021-1035.

Hazır Bıkmaz, F. (2001). *İlköğretim 4. ve 5. sınıf öğrencilerinin fen bilgisi derslerindeki başarılarını etkileyen faktörler.* (Yayımlanmamış doktora tezi). Ankara Üniversitesi Sosyal Bilimler Enstitüsü, Ankara.

Hillman, S. J., Zeeman, S. I., Tilburg, C. E., & List, H. E. (2012). My Attitudes Toward Science (MATS): The development of a multidimensional instrument measuring students' science attitudes. *Learning Environments Research, 19*(2), 203–219. doi: 10.1007/s10984-016-9205-x.

Hodson, D. (2003). Time for action: Science education for an alternative future. *International Journal of Science Education, 25*(6), 645-670.

Hong, Z. R., & Lin, H. (2011). An investigation of students' personality traits and attitudes toward science. *International Journal of Science Education, 33*(7), 1001-1028.

Kaptan, S. (1998). *Bilimsel araştırma ve istatistik teknikleri.* Ankara: Bilim Yayınevi.

Karahan, E., Canbazoglu-Bilici, S., & Unal, A. (2015). Integration of media design processes in science, technology, engineering, and mathematics (STEM) education. *Eurasian Journal of Educational Research, 60,* 221-240. doi: 10.14689/ejer.2015.60.15.

Karasar, N. (1994). *Bilimsel araştırma yöntemi.* Ankara: Nobel Yayın Dağıtım.

Kaya, H., & Böyük, U. (2011). İlköğretim II. kademe öğrencilerinin fen ve teknoloji dersine ve fen deneylerine karşı tutumu. *TUBAV Bilim Dergisi, 4*(2), 120-130.

Kızılcık, H. Ş., Temiz, B. K., Tan, M., & İngeç, Ş. K. (2010). Sözel bölüm öğretmen adaylarının fen bilimlerine, fen eğitimine ve teknolojiye karşı tutumlarının araştırılması. *Eğitim ve Bilim, 32*(146), 80-88.

Koch, J. (1990). The science autobiography. *Science and Children, 28*, 42-43.

Kozcu Çakır, N., Şenler, B., & Göçmen Taşkın, B. (2007). İlköğretim II. kademe öğrencilerinin fen bilgisi dersine yönelik tutumlarının belirlenmesi. *Türk Eğitim Bilimleri Dergisi, 5*(4), 637-655.

Külçe, C. (2005). *İlköğretim ikinci kademe öğrencilerinin fen bilgisi dersine yönelik tutumları* (Yayımlanmamış yüksek lisans tezi). Pamukkale Üniversitesi Fen Bilimleri Enstitüsü, Denizli.

Lee, M. K., & Erdogan, I. (2007). The effect of science-technology-society teaching on students' attitudes toward science and certain aspects of creativity. *International Journal of Science Education, 29*(11), 1315-1327.

Ministry of National Education (2005). *İlköğretim fen ve teknoloji dersi (4 ve 5. sınıflar) öğretim programı.* Ankara: Talim Terbiye Kurulu Başkanlığı.

Ministry of National Education (2006). *İlköğretim fen ve teknoloji dersi (6, 7 ve 8. sınıflar) öğretim programı.* Ankara: Talim Terbiye Kurulu Başkanlığı.

Ministry of National Education (2013). *İlköğretim kurumları (ilkokullar ve ortaokullar) fen bilimleri dersi (3, 4, 5, 6, 7 ve 8. sınıflar) öğretim programı.* Ankara: Talim Terbiye Kurulu Başkanlığı.

Ministry of National Education (2017*). Fen bilimleri dersi öğretim programı (İlkokul ve Ortaokul 3, 4, 5, 6, 7 ve 8. Sınıflar).* Ankara: Talim Terbiye Kurulu Başkanlığı.

National Research Council. (2012). *A framework for K–12 science education: Practices, cross-cutting concepts, and core ideas.* Washington, DC: The National Academies Press.

Nuhoğlu, H. (2008). İlköğretim Fen ve Teknoloji dersine yönelik bir tutum ölçeğinin geliştirilmesi. *İlköğretim Online, 7*(3), 627-639.

Rice, L., Barth, J. M., Guadagno, R. E., Smith, G. A., & Mccallum, D. M. (2013). The role of social support in students' perceived abilities and attitudes toward math and science. *Journal Of Youth And Adolescence, 42(7),* 1028-1040.

Serin, O., Kesercioğlu, T., Saracaloğlu, A. S. & Serin, U. (2003). Sınıf öğretmenliği ve fen bilgisi öğrencilerinin fen (bilimlerin)'e yönelik tutumları. *M.Ü Atatürk Eğitim Fakültesi Eğitim Bilimleri Dergisi, 17,* 75-86.

Serin, U., Serin, O., & Kesercioğlu, T. (2005). Eğitim fakültesi ilköğretim bölümü öğrencilerinin fen bilimlerine yönelik tutumlarının bazı değişkenler açısından karşılaştırılması. *Eğitim ve Bilim, 30*(138), 38-44.

Smith, T. J., Pasero, L., & McKenna, C. M. (2014). Gender effects on student attitude toward science. *Bulletin of Science. Technology & Society, 34*(1-2), 7-12.

Tekbıyık, A., & İpek, C. (2007). Sınıf öğretmeni adaylarının fen bilimlerine yönelik tutumları ve mantıksal düşünme becerileri. *Eğitim Fakültesi Dergisi, 4*(1), 102-117.

Tekin, E. (2000). Karşılaştırmalı tek-denekli araştırma modelleri. *Özel Eğitim Dergisi, 2(4)*, 1-12.

Tereci, H., Aydın, M., & Orbay, M. (2008). Bilim ve sanat merkezlerine devam eden öğrencilerin fen tutumlarının incelenmesi: Amasya bilimsel örneği. http://www.fencebilim.com/ustunyetenek/fen_tutumlari.pdf adresinden 23.05.2016 tarihinde alınmıştır.

Turhan, F., Aydoğdu, M., Şensoy, Ö., & Yıldırım, H. İ. (2008). İlköğretim 8. sınıf öğrencilerinin bilişsel gelişim düzeyleri, fen bilgisi başarıları, fen bilgisine karşı tutumları ve cinsiyet değişkenleri arasındaki ilişkinin incelenmesi. *Kastamonu Eğitim Dergisi, 16*(2), 439-450.

Türkmen, L. (2002). Sınıf öğretmenliği 1. sınıf öğrencilerinin fen bilimlerine ve fen bilgisi öğretimine yönelik tutumları. *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi, (23),* 218-228.

Türkmen, L. (2008a). Turkish elementary students' perceptions about scientist and what factors affecting the image of the scientists. *Eurasian Journal of Mathematics, Science & Technology Education*, *4*, 55-61.

Türkmen, L. (2008b). Sınıf öğretmenliği programında öğrenim gören birinci sınıf düzeyinden dördüncü sınıf düzeyine gelen öğretmen adaylarının fen bilimlerine ve öğretimine yönelik tutumları. *Kastamonu Eğitim Dergisi, 16*(1), 91-106.

van Aalderen-Smeets, S., & van der Molen, J. W. (2013) Measuring elementary teachers' attitudes toward teaching science: Development of the dimensions of attitude toward science (DAS). *Instrument, International Journal of Science Education, 35(4),* 577-600. doi: 10.1080/09500693.2012.755576.

Wu, K.-C., P. P. Shein, C.-Y. Tsai, C.-Y. Chou, Y.-Y. Wu, C.-J. Liu, & T.-C., Huang (2012). An investigation of Taiwan's public attitudes toward science and technology. *International Journal of Science Education, Part B, 2(1),* 1-21. doi: 10.1080/21548455.2011.613643.

Yaşar, Ş., & Anagün, Ş. S. (2008). İlköğretim beşinci sınıf fen ve teknoloji dersi tutum ölçeğinin güvenirlik ve geçerlik çalışmaları. *Anadolu Üniversitesi Sosyal Bilimler Dergisi, 8(2),* 223-234

Yılmaz, M. (2006). İlköğretim altıncı sınıf öğrencilerinin matematik dersine ilişkin tutumlarının bazı değişkenlere göre incelenmesi. *Milli Eğitim Dergisi, 172,* 240-248.

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