Primary School Students' Attitudes towards Science*

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Abstract: This study aims to find out the attitude levels of the fourth grade primary school students towards science and to examine these attitudes according to some variables. The study is designed in descriptive survey model to reveal the present situation. The data were collected through Attitude towards Science Scale, a three-point Likert scale developed by the researchers. A total of 562 students participated in the study. The findings of the study demonstrate that the students' attitudes towards science, which are based on two dimensions including scientific discovery and scientific curiosity, are positive. The students' attitudes towards science do not differ statistically according to their gender. However, their attitudes towards science show statistically significant differences according to whether the students follow a scientific magazine or not, whether they study at a public or private school, whether their mothers are a teacher or not and the educational level of their parents. It is believed that the results will contribute to raising generations with positive attitudes towards science.

Keywords: *Science, attitude towards science scale, primary school student.*

Introduction

Today, one of the most basic characteristics of individuals that is required for this era is to be able to produce new scientific knowledge based on the existing ones. They should be educated as individuals who are interested in science, understand the significance and value of scientific knowledge and develop scientific thoughts (Cermik, 2013). While raising these individuals, their attitudes towards science emerge as a critical issue.

Science, which is a body of evidenced, systematic and objective knowledge, (Bakircioglu, 2012; Karasar, 1995), is the key in raising individuals far from prejudgements. Attitude can be defined as an acquired internal situation that affects the individual's choices in individual activities regarding other individuals, events and various situations (Senemoglu, 2018). Attitudes play an important role in the realization of learning due to its effect on the development of students' decisions and behaviors (Altinok & Un-Acikgoz, 2006). Therefore, it seems reasonable to raise an inquiring, questioning and productive generation thanks to individuals who have positive attitudes towards science. This is possible by revealing individuals' attitudes towards science starting from young ages and trying to eliminate problematic aspects, if any.

In the study conducted by George (2003) with the aim of monitoring the change in the students' attitudes towards the benefit of science in middle and high school years, it was reported that the general tendency of students' attitudes towards the benefit of science was positive. However, another study indicated that students' attitudes towards science constantly increase negatively as their ages progress, and that students' science and technology attitudes are shaped between the ages of 10-14 and this greatly affects their future career preferences (Osborne, as cited in Denessen et al., 2015). Similarly, in a study conducted with the students of fourth to eighth grade, it is stated that the students' attitudes towards science decreased as the grade level increased (Kapici & Akcay, 2016), while in another one, the students' attitudes towards science generally decreased in middle and high school years (George, 2000). In the study carried out by Barrington and Hendricks (1988) regarding the attitudes of 143 intellectually gifted and intellectually average

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students at the third, seventh and eleventh grades towards science and scientific knowledge, it was determined that the most positive attitude belonged to the third graders.

While these research studies suggest that students' attitudes towards science at younger ages are positive, they also point to the necessity that these positive attitudes should be supported in a way that they develop increasingly with the progress of age. That is because students' lack of positive attitudes and beliefs about science at the moment means bad news for future generations (Kapici & Akcay, 2016). Guler and Akman (2006) stated that the negative judgments that children have about science and scientists play a crucial role in shaping their attitudes towards scientific activities, and those negative attitudes may also affect their future school life and cause the individual to be completely disinclined towards science.

When the literature is examined, it is seen that students' attitudes towards science are generally handled within the scope of science course. In this sense, Yilmaz (2007) emphasized that the development of scientific attitude is among the main objectives of science course, and provided evidence that teachers consider science courses as sufficient and effective in students' gaining scientific attitude and behaviors. In the study conducted by Kibar-Kavak (2008), the attitudes of fourth to eighth grade primary school students towards science were examined within the framework of a number of variables. In the study, in order to determine the attitudes of the students towards science and technology, a scale entitled "My Science Lessons", which is reported to be a sub-scale of an international project, was used. In the study in which the attitude towards science was dealt within the scope of science and technology, it was observed that gender variable did not make any difference on the attitude level, but there were differences in the attitude levels according to the occupations of parents, educational status of parents and the students' grades.

Mihladiz and Duran (2010) investigated the attitudes of the sixth, seventh and eighth grade students towards science in terms of demographic variables. In the study, it was stated that while significant differences were found in the students' attitudes towards science according to grade, age, and family income variables, there were no significant differences in terms of the variables including gender and educational background of parents. In another study as well, conducted about students' attitudes towards science and scientific knowledge, no significant difference was found in gender variable (Barrington & Hendricks, 1988). A one-year longitudinal study, which was carried out with the participation of 1822 primary school students aged between 8 and 12 and 91 teachers, focused on the impact of teachers' attitudes towards science and technology on the students' attitudes towards science and technology. As a result of the study, it was revealed that the students' attitudes towards science and technology changed slightly in the positive direction during their primary school education and that girls showed slightly more positive attitudes compared to boys (Denessen et al. 2015).

The fact that students' attitudes towards science are characterised at younger ages reveals the importance of investigating this issue by considering different sample groups and different variables. In the literature review, no study was found conducted with primary school last grade students who are at the age of 10 on average. However, before starting secondary school, it is essential to determine the attitudes of these group of students, to examine the situation based on a number of variables and to reveal the existent situation clearly. Therefore, in this study, the following questions are aimed to be answered:

(1)   What is the attitude level of primary school fourth grade students towards science?

(2)   Is there a significant difference in primary school fourth grade students' attitudes towards science according to (i) their gender, (ii) whether they follow a scientific children's magazine, (iii) the type of school, (iv)whether their mothers are a teacher, (v) their mothers' educational level, and (vi) their fathers' educational level?

Methodology

Research Design

This study, which aims to find out the attitude levels of the primary school fourth grade students towards science and to examine these attitudes according to some variables, is designed in descriptive survey model to reveal the existent situation. In descriptive studies, while trying to describe the qualities related to the case studied, it is tried to reveal the attitudes, opinions or behaviors of the individuals participating in the research (Borg et al., 1993; Creswell, 2008). The survey model is a research approach that aims to describe a past or present situation as it is; and the case, individual or object that is the subject of the research is tried to be defined in its own conditions and in the way as it is (Karasar, 1995).

Population and Sample

The study was carried out with the fourth grade primary school students in Denizli province in the spring term of 2018-2019 academic year. The number of students studying in the fourth grade in Denizli city center in the abovementioned term was determined to be 8898. The sample of the study consisted of a total of 562 students studying in seven different primary schools in Denizli city center. This number is large enough to represent the population (Gay, 1996: 125). Two of the seven schools were selected from private schools and the other five from public schools randomly. The

number of students studying in public schools was 446 (79.4%), and the number of students studying in private schools was 116 (20.6%). Of these students, 283 (50.4%) were girls and 279 (49.6%) were boys.

Data Collection Tool

In the study, first it was examined if there were any measurement tools that can reveal primary school students' attitudes towards science. However, a scale that was suitable for the fourth grade students at the age of 10 on average and was developed based on the purpose of the research was not encountered.

For this reason, in the study, *Attitude towards Science Scale* developed by the researchers was used as the data collection tool. The scale was designed in a three-point Likert type scale. The agreement levels were numbered as (3) agree, (2) partially agree, (1) disagree. The validity and reliability studies of the *Attitude towards Science Scale* are presented in detail in the findings section.

Data Analysis

The data collected from a total of 562 elementary school students with *Attitude towards Science Scale* were analyzed through SPSS 22.00 program. The scale was designed in a three-point Likert type scale. The students were asked to state their agreement level for each attitude item in the scale.

The total score of the scale was obtained from the item-total scores of each data collection tool included in the implementation. The highest score that can be obtained from the scale was found to be 42, and the lowest score was determined as 14. Greatness of the total score was evaluated as the students' having a positive attitude towards science. By using the score range formula (highest value-smallest value / interval coefficient) (Sumbuloglu & Sumbuloglu, 1993; Tavsancil, 2005), the range coefficients were calculated as '1.00-1.66 disagree', '1.67-2.33 partially agree' and '2.34-3.00 agree'.

In order to determine which statistical techniques to use to find out the answers to the research questions, the distribution feature of the total scores of Attitude towards Science Scale used in the study was examined. One-sample Kolmogorov - Smirnov test was used to determine whether the data showed normal distribution. Since it was determined that the scale was not normally distributed (K-S(z) = 0.107; $p < 0.05$), the data were analyzed by using nonparametric statistical techniques.

Findings

Findings Related to the Development of the 'Attitude towards Science Scale'

In the process of developing the scale, first of all, an item pool consisting of 35 items was created. Considering the fact that the participants are at a young age, three options were placed opposite each item that was created in order to determine the level of agreement to the statements in the items. These options were designed as follows: (1) disagree, (2) partially agree, (3) agree and they were scored.

The draft items were presented to two linguists, an assessment and evaluation expert, two curriculum development experts and a science education expert. The experts were asked for their opinions regarding content, expressions and wording, spelling and punctuation errors. In line with the suggestions, a draft scale of 26 items consisting of six negative and 20 positive items was created. Then, the scale, which was designed in two parts (consisting of the first part prepared to gather personal information and the second part prepared to obtain data based on the purpose of the research), was implemented to 621 primary school fourth graders.

The implementation was performed by the researchers in the students' classes in a time frame of approximately 40 minutes, based on a predetermined schedule. The students were first asked not to write their names on the scale during the implementation process that was conducted with the voluntary participation of the students. They were informed about the importance of expressing their real thoughts, and they were assured that their information would be kept confidential. In the preliminary examination carried out on the collected data, 59 scales were not included in the study since they were not filled in fully, and the analyses were performed on a total of 562 scales.

In order to determine the construct validity of *Attitude towards Science Scale*, Kaiser-Meyer-Olkin (KMO) and Bartlett test analyses were performed first and their results were determined as KMO = 0.866 and χ^2 = 2737.674; df = 325 (p = 0.000) for the Bartlett test. Since KMO value higher than 0.60 in the social sciences is regarded as sufficient to perform factor analysis (Buyukozturk, 2002), it was decided that factor analysis could be conducted on the 26-item scale. As a result of the analyses, 12 items with factor loading values lower than 0.30 and that do not have at least 0.100 difference between their loadings under the given factor although placed in multiple factors were excluded from the scale (Balci, 2009; Buyukozturk, 2002). The analyses were repeated on the remaining 14 items.

It was determined that the remaining 14 items containing two negative and 12 positive statements were gathered under two factors. It was determined that the KMO value of the 14-item scale was 0.895 and the Bartlett test values were χ^2 = 1563.922; df = 91; (p = 0.000). While the unrotated factor loadings of the remaining 14 items in the scale

varied between 0.490 and 0.665, it was observed that these loadings were found to be between 0.474 and 0.799 when they were rotated after the Varimax rotation technique.

On the other hand, it was determined that the items and factors included in the scale explained 46.81% of the total variance. As is known, it is regarded as acceptable in social sciences that the factor loadings are not below 0.30 and the amount of variance explained is at least 40% (Buyukozturk, 2002; Eroglu, 2008). This finding obtained through Exploratory Factor Analysis (EFA) is presented in Figure 1, which is plotted according to the eigenvalues.
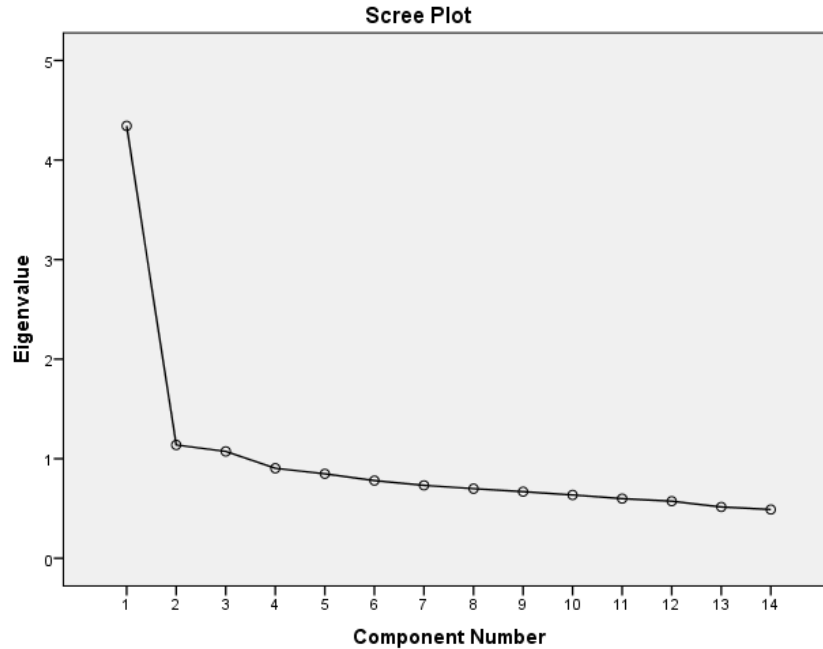

Figure 1. Eigenvalues according to the factors

According to Figure 1, there is a dramatic fall in the first two factors; therefore, these two factors contribute significantly to the variance; on the other hand, the decline in the other factors is gradually becoming horizontal, which means that their contribution to the general variance is not sufficient (Buyukozturk, 2002; Eroglu, 2008).

On the other hand, the contents of the items that are gathered under two factors were examined and factor names were given. It was determined that 7 items were placed under the first factor named as *scientific discovery*, and 7 items were placed under the second factor named as *scientific curiosity*. As a result of these processes, the findings regarding the item loadings of the 14 items remaining in the scale according to the factors, the eigenvalues of the factors and the amount of variance explained by the factors are presented in Table 1.

Table 1. Common Variances, Item Factor Loadings, Variances Explained by Sub-Scales, Item Analysis Results and Item-Total Correlation Analysis Results

Items	Common variances	Item-Total correlation	Scientific discovery	Scientific curiosity
1	.505	.552	.653	
2	.435	.467	.555	
3	.358	.333	.385	
8	.445	.504	.594	
12	.491	.376	.452	
22	.403	.492	.555	
24	.610	.378	.415	
9	.398	.393		.457
13	.471	.564		.645
14	.575	.484		.573
20	.504	.516		.614
21	.426	.411		.479
23	.618	.359		.381
26	.401	.508		.577
Eigenvalues			4.343	1.138
Explained variance			31.01	15.80
Total variance			46.81%	

As can be seen in Table 1, the *scientific discovery* factor of the scale contains 7 items and factor loadings vary between 0.385 and 0.655. The eigenvalue of this factor in the overall scale is 4.343; and its contribution to the general variance is 31.01%. The *scientific curiosity* factor includes 7 items. Factor loadings of the items are between 0.383 and 0.655. The eigenvalue of the factor in the general scale is 1.138; and its contribution to the general variance is 15.80%. When the item-total correlation values related to the scale as a whole were examined, the lowest correlation value was found to be 0.333 and the highest value was 0.564. These coefficients are the validity coefficients of each item and show the consistency both with the factor and the whole scale. In other words, they indicate the items' level of serving the general purpose of the scale (Baykul, 2000).

It was aimed to confirm the existence of the dimensions of the scale which was determined to consist of two factors as a result of EFA. For this purpose, Confirmatory Factor Analysis (CFA) was performed on the data obtained. Confirmatory factor analysis is based on the principle of analysing and testing the relationships between observed and unobserved variables as a hypothesis (Pohlmann, 2004).

As a result of the analysis performed, χ^2 / df ratio was calculated as 2.059 (χ^2 = 156.469, df = 76, p = 0,000).). χ^2 / df ratio that is 5 or less is considered sufficient for model-data fit (Schumacker & Lomax, 2004; Wang et al., 2006). On the other hand, χ^2 / df ratio being less than 3 points to the goodness of model-data fit (Schumacker & Lomax, 2004). χ^2 / df value obtained in the study as 2.059 is an important indicator that the measurement tool is two-dimensional.

Another important index, RMR, was calculated as 0.020. It is required that The RMR index is between 0 and 1 (Golob, 2003). Other goodness of fit indices were calculated in order to evaluate the fit of the model. The results were determined as Incremental Fit Index (IFI) = 0.946; Comperative Fit Index (CFI) = 0.946; Goodness of Fit Index (GFI) = 0.963; Normed Fit Index (NFI) = 0.901; Adjusted Goodness of Fit Index (AGFI) = 0.948; Relative Fit Index (RFI) = 0.881. While indices between 0.80 and 0.90 are commonly regarded as acceptable; an index above 0.90 represents a good fit (Yap & Khong, 2006; Wang et al., 2006). RMSEA was found to be 0.043 as a result of the analysis. While the RMSEA index being less than 0.10 indicates that the model-data fit is at an acceptable level, if it is below 0.05, then it is a sign of a greater fit (Bayram, 2013).

Considering the values of χ^2 / df, RMSEA and RMR, the measurement tool can be said to consist of two dimensions. Additionally, Table 2 demonstrates the relationship between the items and latent variables used in this study.

Table 2. Relationship between Items and Latent Variables

Items	Scale	Estimate	Standard Error	Critical ratio	p
24	Scientific discovery	.840	.097	8.662	0.000
22	Scientific discovery	1.149	.147	7.839	0.000
12	Scientific discovery	.799	.113	7.088	0.000
8	Scientific discovery	1.083	.134	8.063	0.000
3	Scientific discovery	.897	.139	6.451	0.000
2	Scientific discovery	1.031	.132	7.839	0.000
1	Scientific discovery	1.170	.140	8.352	0.000
26	Scientific curiosity	.999	.096	10.220	0.000
23	Scientific curiosity	.631	.085	7.452	0.000
21	Scientific curiosity	.889	.099	8.988	0.000
20	Scientific curiosity	1.065	.099	10.741	0.000
14	Scientific curiosity	.999	.097	10.254	0.000
13	Scientific curiosity	1.083	.098	11.085	0.000
9	Scientific curiosity	.860	.099	8.665	0.000

When Table 2 is examined, it can be seen that all the items used in the *Attitude towards Science Scale* are significant and above the critical ratio.

Reliability is a concept about whether a measurement tool produces measurement results in a manner that gives the same result every time it is used to measure a variable (Balci, 2009; Baykul, 2000). As a result of EFA and CFA, it was determined that *Attitude towards Science Scale* was a-14 item scale consisting of two factors as *scientific discovery* and *scientific curiosity*.

Composite reliability, generally called *construct reliability,* is a measure of internal consistency in scale items, almost similar to Cronbach's Alpha (Raykov, 1997). It can be thought of as being equal to the total amount of true score variance relative to the total scale score variance. Data from the CFA indicated that the composite reliability of the first factor, scientific discovery is .737 and second factor, scientific curiosity is .719. Composite reliability of the whole scale was .843.

Cronbach's Alpha reliability analysis was carried out to determine the reliability levels of these factors in terms of internal consistency. Cronbach's Alpha reliability coefficients of the scale were 0.735 for the *scientific discovery* factor

consisting of seven items, 0.702 for the *scientific curiosity* factor of seven items, and 0.825 for the entire measurement tool (14 items). Cronbach's Alpha reliability coefficients which are 0.60 and above are generally considered sufficient in Social Sciences. On the other hand, the reliability coefficient used in the development and implementation of psychological tests is expected to be 0.70 and above (Buyukozturk, 2002). According to the findings, it can be said that the internal consistency coefficients of the scale are high, and as a result, the measurement tool is reliable.

Findings Related to the First Research Question

The first research question of the study was as follows: "What is the primary school fourth grade students' level of attitudes towards science?". As a result of the analyses performed to answer this question, the descriptive statistics regarding the primary school students' attitudes towards science and the factors affecting these attitudes are presented in Table 3.

Table 3. Statistics Related to the Primary School Fourth Grade Students' Attitudes towards Science

	Number of items	Mean	SD	Agreement Level
Scientific Discovery	7	2.58	0.40	Agree
Scientific Curiosity	7	2.32	0.45	Partially Agree
Total Scale	14	2.45	0.38	Agree

Table 3 demonstrates that the primary school students responded to the attitude items in scale by stating "agree" with an arithmetic mean of 2.45 and their attitudes towards science are reported to be high. Likewise, the primary school students responded to the scientific discovery factor consisting of seven items by stating "agree" with an arithmetic mean of 2.58, and it is seen that their attitudes towards this dimension are also high. They responded to the scientific curiosity factor by choosing "partially agree" with an arithmetic mean of 2.32. This finding indicates that their attitudes towards this dimension are moderate.

Each item belonging to the factors that constitute the attitudes of the primary school students towards science, the arithmetic means and standard deviations of the items, and the agreement levels of the primary school students on the relevant item are also presented in detail in Table 4 below.

Table 4. Statistics on the Factors Affecting Primary School Students' Attitudes towards Science

Factor	No	Items	Mean	SD	Agreement
Scientific Discovery	12	I like scientific trips.	2.71	0.57	Agree
	8	Learning new scientific information makes me happy.	2.66	0.59	Agree
	2	Studying scientific discoveries makes me happy.	2.63	0.60	Agree
	1	Dealing with science makes me happy	2.63	0.58	Agree
	3	Science makes me excited.	2.55	0.76	Agree
	22	I believe my perspective is broadened if I deal with science	2.57	0.67	Agree
	24*	I don't do any research about science unless I have to.	2.32	0.79	Partially Agree
Scientific Curiosity	23*	I don't care about learning scientific information.	2.61	0.68	Agree
	13	I want to learn new scientific information every day.	2.40	0.69	Agree
	14	I enjoy reading magazines about science.	2.39	0.71	Agree
	26	I carefully listen to science talks around me.	2.38	0.71	Agree
	20	I enjoy reading scientific stories.	2.37	0.71	Agree
	9	I like to research scientists' lives	2.27	0.77	Partially Agree
	21	I follow the current news about science.	1.96	0.76	Partially Agree

Reverse coded

When Table 4 is analyzed, it is seen that the item "I like scientific trips" has the highest arithmetic average while the item "I follow the current news about science" has the lowest arithmetic average.

Findings Related to the Second Research Question

The second research question of the study was as follows: "Is there a significant difference in primary school fourth grade students' attitudes towards science according to (i) their gender, (ii) whether they follow a scientific children's magazine or not, (iii) the type of school, (iv) whether their mothers are a teacher, (v) their mothers' educational level, and (vi) their fathers' educational level?"

Mann Whitney U test was used in order to find out if there is a significant difference in the primary school fourth graders' attitudes towards science according to (i) their gender, (ii) whether they follow a scientific children's magazine or not, (iii) the type of school, (iv) whether their mothers are a teacher. The analysis results are presented in Table 5.

Table 5. Analysis of Primary School Students' Attitudes towards Science According to Some Variables

		N	Mean rank	Sum of ranks	U	Z	p
(i)	Female	283	276.11	78140.50	37954.500	-.793	.428
Gender	Male	279	286.96	80062.50			
(ii)	Yes	75	358.87	26915.00	12460.000	-4.441	.000*
Following a magazine	No	487	269.59	131288.00			
(iii)	Private School	116	314.19	36446.50	22075.500	-2.439	.015*
School Type	Public School	446	273.00	121756.50			
(iv)	Teacher	74	327.02	24199.50	14687.500	-2.593	.010*
Mother'sprofession	Other	488	274.60	134003.50			

*p<0.05

When Table 5 is examined, it is seen that the attitudes of the primary school students towards science do not show a significant difference according to the gender variable at the significance level of 0.05 (U = 37954.500; p =.428; p> 0.05). Based on this finding, it can be said that the attitudes of male and female students towards science have similar characteristics. However, significant differences were found in the attitudes of the students at the significance level of 0.05 according to whether they follow a scientific magazine in favor of those following a scientific magazine (12460.000; p=.000; p<0.05); according to the type of school in favor of the private school students (U = 22075.500; p=.015; p<0.05); according to mother's profession in favor of those with teacher mothers (U = 14687.500; p=.010; p<0.05)

Kruskal Wallis-H test was used to reveal whether the primary school students' attitudes towards science differ according to their mothers' education level. The analysis results obtained are presented in Table 6.

Table 6. Analysis of the Attitude Levels of Primary School Students towards Science According to the Education Level of Their Mothers

(v) Mother's educational level	N	Mean rank	χ^2	p	Difference
I. Illiterate	19	216.16			I-V*
II. Primary School	143	270.16			II-V*
III. Secondary School	108	255.16	33.432	.000	III-V*
IV. High School	118	246.37			IV-V*
V. University	174	338.13			

*more positive

According to Table 6, the attitudes of the students towards science show a significant difference (χ^2= 33.432; p=.000; p <0.05) according to the education level of their mothers. A paired comparison Mann - Whitney U analysis was performed to determine at which level of mother's education this difference is in favor of the students. There is a significant difference between the levels of university graduate and illiterate in favor of university graduates (U = 939.500; p=.002; p <0.05). There is a significant difference between the levels of university graduate and primary school graduate in favor of university graduates (U = 9354.000; p =.000; p <0.05). There is a significant difference between the levels of university graduate and secondary school graduate in favor of university graduates (U = 6703.500; p =.000; p <0.05). There is also significant difference between the levels of university graduate and high school graduate in favor of university graduates (U = 6906.000; p =.000; p <0.05).

Kruskal Wallis-H test was used to reveal whether the primary school students' attitudes towards science differ according to their fathers' education level. The analysis results obtained are presented in Table 7.

Table 7. Analysis of the Attitude Levels of Primary School Students towards Science According to the Education Level of Their Fathers

(vi) Father's educational level	N	Mean rank	χ^2	p	Difference
I. Illiterate	7	199.21			I-V*
II. Primary School	67	254.17			II-V*
III. Secondary School	137	252.86	21.721	.000	III-V*
IV. High School	151	270.24			IV-V*
V. University	200	322.34			

*more positive

When Table 7 is examined, the attitudes of the primary school students towards science show a significant difference (χ^2 = 21.721; p =.000; p <0.05) according to the education level of their fathers. A paired comparison Mann - Whitney U

analysis was conducted to determine at which level of father's education this difference is in favor of the students. Significant differences were found between university graduates and illiterates in favor of university graduates (U = 405.000; p =.05; p = 0.05). There is a significant difference between university graduates and primary school graduates in favor of university graduates (U = 5078.000; p =.003; p <0.05). Significant differences were determined between university graduates and secondary school graduates in favor of university graduates (U = 10331.500; p =.000; p <0.05) and between university graduates and high school graduates in favor of university graduates (U = 12218.000; p =.002; p <0.05).

Discussion and Conclusion

In this study, which was conducted to reveal the attitude levels of primary school fourth graders towards science, it is observed that the students have a high level of attitude towards science. It is absolutely a desired situation, but as a result of the findings obtained, one point is remarkable. The students' attitudes towards science are based on two main factors. It was determined that the students' attitudes were high in the scientific discovery factor, the first one, and the medium level in the other dimension, the scientific curiosity factor. This result reveals the need to carry out the activities that will stimulate the curiosity of the young students. It is highly essential to make efforts to nourish curiosity of students that they have innately. Curiosity is also the key to learning.

In the study, it was concluded that the attitudes of the primary school students towards science did not differ according to their gender. There was no statistically significant difference between the attitudes of the male or female students towards science. This situation is consistent with similar research results (Barrington & Hendricks, 1988; Kibar-Kavak, 2008; Mihladiz & Duran, 2010). However, the students' attitudes towards science differed according to some variables examined within the scope of the research.

It is reported that the students who follow a scientific magazine have more positive attitudes than those who do not. Based on this result, it can be recommended to carry out activities that enable primary school students to follow scientific journals and sources in accordance with their levels. Primary school teachers can subscribe their classes to these journals. Thus, a group of students can influence each other to follow these publications more willingly and students' attitudes towards science can be enhanced to be more positive. It is also important to consider that teachers should perform higher quality science education in order to increase their students' attitudes towards science. Because contemporary educational reform efforts highly emphasize the need for high quality science and mathematics teaching in primary schools (Koutsianou & Emvalotis, 2019).

In the study, it was concluded that the attitudes of the students studying at private school towards science were more positive than those studying at state schools. To be able to find out the reason for this result, a meeting was held with the private schools included in the study. It was observed that both the students and teachers are involved in a number of national and international studies in private schools. In addition, the students are offered a wide variety of opportunities and resources to improve themselves. It is thought that the reasons listed may lead to the students at private schools to have significantly higher attitudes towards science. However, this can be a study subject of another study that needs to be studied in detail.

It is also concluded that the attitudes of children whose mothers are teachers were more positive than the children of other mothers. In the data collection process, the primary school students were not asked about the gender of their teachers and this is considered to be a limitation of the study. If the attitudes of primary school students towards science changed according to the gender of their teachers, the results to be obtained could be related to mothers' being teachers. For instance, if the attitudes of primary school students towards science were in favor of the students with female teachers, then this might suggest that female teachers transferred their sensitivity and knowledge to the students studying in their class as well as their own children. It can be recommended that this issue can be investigated in other studies to be conducted.

One of the components that play an active role in the formal education process is parents (Sahin, 2019). In the study, the students' attitudes towards science differed according to the education level of both their mothers and fathers, a result which is parallel with a similar study (Kibar-Kavak, 2008) and different from another (Mihladiz & Duran, 2010). The results obtained in the study showed that the attitudes of the students with parents having university education towards science are more positive than those with the parents of all other groups (illiterates, primary school graduates, secondary school graduates, high school graduates). It is believed that individuals with university education contribute positively to their children's education and therefore to their attitudes towards science thanks to the scientific perspective they have acquired during their academic life.

Recommendations

It is vital that individuals have positive attitudes towards science from a young age, and problematic aspects, if any, are eliminated. With regard to the importance of the subject, it can be suggested that studies are performed with different sample groups on the attitudes of primary school students towards science. However, based on the results obtained from the study, it is believed that studies supported with qualitative data can contribute significantly to the field in the framework of variables that create statistical difference in students' attitudes towards science.

Limitations

The study provided research-based evidence about the attitude levels of primary school fourth graders towards science. However the research also has some limitations. Firstly, this research is limited to the attitude of primary school fourth grade students towards science. Studies can be carried out for all grades at primary level. Secondly, the research is limited to only quantitative data collected through the "Attitude towards Science Scale" developed by the researches.

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Appendix

"Attitude towards Science Scale" Turkish Version

"Bilime ilişkin tutum ölçeği" maddeleri

Faktör	No	Yeni no	Maddeler
Bilimsel keşif	12	6	Bilimsel gezilerden hoşlanırım.
	8	4	Bilimle ilgili öğrendiğim yeni bilgiler beni mutlu eder.
	2	2	Bilimsel buluşları incelemek beni mutlu eder.
	1	1	Bilimle ilgilenmek beni mutlu eder.
	3	3	Bilim beni heyecanlandırır.
	22	11	Bilimle ilgilenirsem bakış açımın zenginleşeceğini düşünürüm.
	24*	13*	Mecbur olmadıkça bilimle ilgili araştırma yapmam
Bilimsel merak	23*	12*	Bilimsel bilgiler öğrenmeye önem vermem.
	13	7	Her gün yeni bir bilimsel bilgi öğrenmek isterim.
	14	8	Bilimle ilgili dergileri okumaktan zevk alırım.
	26	14	Çevremde bilimle ilgili konuşmaları dikkatle dinlerim.
	20	9	Bilimsel öykü okumaktan zevk alırım.
	9	5	Bilim insanlarının hayatlarını araştırmaktan hoşlanırım
	21	10	Bilim ile ilgili güncel haberleri takip ederim.

*Ters kodlanan

"Attitude towards Science Scale" English Version

"Attitude towards Science Scale" items

Factor	No	Renumber	Items
Scientific Discovery	12	6	I like scientific trips.
	8	4	Learning new scientific information makes me happy.
	2	2	Studying scientific discoveries makes me happy.
	1	1	Dealing with science makes me happy
	3	3	Science makes me excited.
	22	11	I believe my perspective is broadened if I deal with science
	24*	13*	I don't do any research about science unless I have to.
Scientific Curiosity	23*	12*	I don't care about learning scientific information.
	13	7	I want to learn new scientific information every day.
	14	8	I enjoy reading magazines about science.
	26	14	I carefully listen to science talks around me.
	20	9	I enjoy reading scientific stories.
	9	5	I like to research scientists' lives
	21	10	I follow the current news about science.

*Reverse coded