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*Examination of Secondary School Students' Views towards Scientific Knowledge**

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Abstract

The aims of this study are to identify the views of the secondary students towards scientific knowledge and to analyze the relationship between their views towards scientific knowledge and their academic achievement and scientific attitudes. The participants of the study are a total of 634 sixth, seventh and eighth grade students attending those schools serving to the students with a lower, medium or higher socio-economic status in a city in western Turkey. The data of the study were collected through the use three different tools, namely "Scale on Views towards Scientific Knowledge", "Scientific Attitude Scale" and "Demographic Form". The findings of the study showed that students have nearly positive views towards scientific knowledge. It is further found that their views towards scientific knowledge significantly vary based on their gender and grade level. In addition, the total scores of students in regard to their views towards scientific knowledge are positively correlated with their academic achievement and total scores of scientific attitude. Based on the findings of the study, activities to improve the students' views towards scientific knowledge can be carried out not only in science and technology courses, but also in other courses.

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INTRODUCTION

At the beginning of the twentieth century educators recognized the significance of understanding about science and the nature of science in science education. This recognition was formalized through a conference held by Science and Math Teachers Association in the US in 1907 and the necessity of focusing on scientific process and methods was emphasized in the conference (Irez and Turgut, 2008). Similarly, today's educators pay attention to improve positive views *towards* science and the nature of scientific knowledge in students.

Scientific knowledge is in a process of continuous change in parallel to advances in the world. This process also affects the understanding of science. As a result of this, there are no exact definitions of scientific knowledge and its nature. On the other hand, the terms nature of science and nature of scientific knowledge have used interchangeably. However, the term nature of science is much more comprehensive term, which also includes the other term, namely nature of scientific knowledge. In a similar vein, such terms as "Epistemological View", "Epistemological Belief", and "Scientific Knowledge" are used interchangeably in the field of science education (Ünal-Çoban and Ergin, 2008). Ryder and Leach (2006); Saunders, Cavallo and Abraham (2001) states that scientific knowledge or scientific epistemology is about the development of scientific knowledge, how the truthness of such knowledge is verified and how theoretical models and the facts they explain are related. However, if scientific knowledge is handled in epistemology in terms of philosophy it deals with the source, truthness, limitations and nature of scientific knowledge.

Traditional science understanding and contemporary science understanding offer different definitions of scientific knowledge. The former argues that scientific knowledge provides the correct answers and that it is discovered through observations and experiments. Contemporary science approach, on the other hand, argues that observations and experiments that are basis of scientific knowledge are closely based on hypothesis and that scientific knowledge is collectively structured through cooperation and approval by scientific community (Palmquist and Finley, 1997).

Çepni et. al. (2011) states "Scientific knowledge is those acquired through the use of reliable methods." In addition scientific knowledge has many common characteristics, for instance, it is general and specific, historical, integrative, and can be repeated. Scientific knowledge is also empirical, related to human beings and culture, not absolute and has the potentiality. Changes in the science approach also lead to changes in the definitions of scientific knowledge. The followings are common features of scientific knowledge posited by researchers from different disciplines. Scientific knowledge is:

- Not absolute,
- Empirical,
- Subjective,
- Affected from both imagination and creativity,
- Produced as a result of the combination of observations and inferences, and
- is based on social and cultural contexts (Çelikdemir, 2006; Doğan, Çakıroğlu, Bilican & Çavuş, 2009; Lederman, Abd-El-Khalick, Bell & Schwartz, 2002; Smith & Scharman, 1999; Ryan & Aikenhead, 1992).

Scientific topics and concepts in Turkish curriculum are delivered under the course of life sciences until the 4th class and then under the course of science and technology (Türkmen and Bonnstetter, 1998). Therefore, the significance of basic education is clear in this regard, since it attempts to prepare students

for higher levels of education through giving them basic knowledge and skills. It can be argued that the attitude of basic students towards science and scientific knowledge affects their future approach towards science and their future achievements. Therefore, the attitudes of students towards science and scientific knowledge should be analyzed in order to inform the programs.

There are many comprehensive studies regarding scientific knowledge, which mostly focus on the development of scales and definitions of perceptions (Abd-El-Khalick & Lederman, 2000; Abd-El-Khalick & Khishfe, 2002; Akerson, Abd-El-Khalick & Lederman, 2000; Akerson & Volrich, 2006; Bell, Lederman & Abd-El-Khalick, 2000; Cannon & Simpson, 1985; Haidar, 1999; Kang, Scharmann & Noh, 2005; Khishfe & Lederman, 2006; Mellado, 1998; Murcia & Shibeci, 1999; Thye & Kwen, 2003). Although such studies are not very common in Turkey, there are some studies dealing with the relationship between nature of science and scientific knowledge and certain variables of age, grade level, parental educational background and academic achievement (Akşan, 2011; Balantekin, 2013; Bora, 2005; Bülbül & Küçük, 2007; Çelikdemir 2006; Kılıç, Sungur, Çakıroğlu & Tekkaya 2005; Küçük 2006; Küçük & Küçük 2011; Özmusul 2012; Savaş 2011; Uzun 2011; Ünal-Çoban & Ergin 2008; Yankayış, Güven & Türkoğuz, 2014; Yenice & Özden, 2013; Yenice & Saydam 2010; Yiğit, Alev, Akşan & Ursavaş 2010). However, in those studies on the nature of science the terms scientific knowledge and nature of science are used interchangeably (Çelikdemir, 2006; Küçük, 2006; Küçük & Çepni, 2006; Muşlu, 2008). Such approach requires the detailed study of students' views towards scientific knowledge.

In the studies dealing with primary students' views towards scientific knowledge, it is found that there is a positive correlation between students' views towards scientific knowledge and their attitudes towards science (Uzun, 2012). However, there is limited study discussing the relationship between secondary school students' views towards scientific knowledge and their scientific attitudes (Özden and Yenice, 2014). Özden and Yenice (2014) found that scores of the secondary school students' in the scale of views about scientific knowledge are positively correlated with their academic achievement and their scores in the scale of scientific attitude. Therefore, secondary school students' views towards scientific knowledge should be analyzed in terms of scientific attitudes.

Purpose of the study

The aims of this study are to identify the views of the secondary students towards scientific knowledge and to analyze the relationship between their views towards scientific knowledge and their academic achievement and attitudes towards science. In parallel to these aims, the study seeks to answer the following research questions:

- How can be secondary students' views towards scientific knowledge categorized?
- Do the views of secondary students towards scientific knowledge vary based on their gender, grade level and income level of their families?
- Do the views of secondary students towards scientific knowledge correlated their academic achievement and scientific attitudes?

METHOD

Design

The study, which is a descriptive research, has the model of relational scanning. Relational scanning models attempt to identify the change that occurs among variables and/or to determine the level of change that takes place (Karasar, 2007).

Sample and Environments

The participants of the study are a total of 634 sixth, seventh and eighth grade students from four different basic education schools in Aydın. The schools were selected following purposive stratified sampling method. Before the selection process, all the schools in Aydın were categorized based on the socio-economic status of the students they serve. The data on socio-economic status of the students were taken from Aydın provincial education directorate. Two schools from those serving the students with lower socio-economic status were selected randomly. For those schools serving the students with medium and higher socio-economic status, one school was chosen randomly for each category. Purposive stratified sampling method is mostly used to indicate, describe the characteristics of lower socio-economic groups and make comparisons among them (Büyüköztürk, 2008). Demographical characteristics of the participants are given in Table 1.

Table 1. Demographical Characteristics of the Participants

Gender	f	%
Male	306	48,3
Female	328	51,7
Grade Level	**f**	**%**
6.grade	212	33,4
7.grade	206	32,5
8.grade	216	34,1
Income Level of Their Families	**f**	**%**
High level	278	43,8
Medium level	159	25,1
Lower level	197	31,1

Data Collection Tools

The data of the study were collected through the use of two scales, namely "*Scale of Views towards Scientific Knowledge*" and "*Scale of Scientific Attitudes*". Academic achievement of the students is used as their grades in the course of science and technology in the fall semester of the school year of 2011-2012. Data on the demographical characteristic of the students are gathered with the use of "Demographical Form".

The scale of views towards scientific knowledge was developed by Ünal-Çoban and Ergin (2008). It is consisted of 16 items and three dimensions. Answers to the items are given using a Likert type scale. The dimensions and the items involved in each dimension are as follows: Dimension 1 "Scientific knowledge is closed" (items 1, 5, 8, 9, 10, 12, 15 and 16), Dimension 2 "Scientific knowledge is justified" (items 2, 6, 11, 13 and 14) and Dimension 3 "Scientific knowledge may change" (items 3, 4 and 7). The Cronbach Alpha

coefficient in the original study was found to be 0.72 for Dimension I, 0.69 for Dimension 2, and 0.66 for Dimension 3. Its overall Cronbach alpha coefficient was found to be 0.83. In the current study the following values were found: 0.70 for Dimension 1, 0.66 for Dimension 2, and 0.60 for Dimension 3. Its overall Cronbach alpha coefficient was found to be 0.78.

The scale of scientific attitudes (SSA) was developed by Moore and Foy (1997) in order to identify the secondary students' scientific attitudes. The scale was adapted into Turkish by Demirbaş and Yağbasan (2006). The scale is made up of forty items and six sub-dimensions. Five of the sub-dimensions are towards nature of science and working process of scientists. The other sub-dimension is towards the views of students towards science. In the original study, the Cronbach Alpha coefficient of the scale was found to be 0.76. In the current study, it was found to be 0.72.

Data Analysis

The data collected were analyzed through the use of statistical software package. The data were firstly analyzed with descriptive statistical techniques (frequency, arithmetical means, standard deviation and percentage).

In order to use One Way ANOVA and t-tests for independent samples, the scores of dependent variable scores should distribute normally and variance should be homogeneous (Büyüköztürk, 2008). For this requirement, the scores of the students in two data collection tools were analyzed in terms of normality by the kolmogorov-smirnov test. The results of the kolmogorov-smirnov test analysis showed that the scores of the students in two data collection tools did not distribute normally ($p<0.05$).

In addition to descriptive statistics the Mann Whitney U-test and Kruskal Wallis H-test were employed in the data analysis. The Kruskal Wallis H-test indicated the statistically significant differences between groups. Mann-Whitney U test with Bonferroni correction was used to see the source of these differences. Because, having a greater number of groups compared in this study leads to an increase in the margin of error in a binary comparison. Therefore, Bonferroni correction for the level of statistically significance in analysis was made. The level of statistical significance in the Mann Whitney U with Bonferroni correction $p=0.05/3=0.0167$, was taken as $p<0.05$ in others. The Spearman Brown range difference correlation was employed to identify the relationship between the students' views towards scientific knowledge, academic achievement and scientific attitudes.

FINDINGS

Table 2 shows the scores of the students from the scale of views towards scientific knowledge together with means and standard deviations.

Table 2. *Descriptive Analysis of The Students Views' towards Scientific Knowledge*

	N	$\bar{X}$	*SD*	*Min*	*Max*
Scientific Knowledge is Closed	634	2.59	0.64	1.13	4.50
Scientific Knowledge is Justified	634	4.36	0.51	2.20	5.00
Scientific Knowledge may Change	634	4.00	0.68	1.33	5.00
Total	634	3.41	0.37	2.25	4.75

As can be seen in Table 2, the mean score for the Dimension 1 "Scientific knowledge is closed" is ($\bar{X}$ = 2.59). Their mean scores for Dimension 2 "Scientific knowledge is justified" and Dimension 3 "Scientific

knowledge may change" are found to be ($\bar{X}$ = 4.36; $\bar{X}$ =4.00), respectively. Mean total score from the scale is found to be ($\bar{X}$ =3.41). Since the median score on the scale is ($\bar{X}$ =3.00), it can be argued that the students participated in the study have mostly positive views towards scientific knowledge.

The results of the Mann Whitney U- Test that was used in order to see if gender leads to any significance difference in the in total and sub-total scores are given in Table 3.

Table 3. *The Mann Whitney-U Analysis Results of Views towards Scientific Knowledge According to Gender Variable*

	Gender	*N*	*Mean of ranks*	*Total rank*	*U*	*p*
Scientific Knowledge is Closed	Male	306	335.63	102703.00	44636.00	0.016*
	Female	328	300.59	98592.00		
Scientific Knowledge is Justified	Male	306	302.29	92499.50	45528.50	0.042*
	Female	328	331.69	108795.50		
Scientific Knowledge may Change	Male	306	326.01	99758.00	47581.00	0.254
	Female	328	309.56	101537.00		
Total	Male	306	330.69	101191.50	46147.50	0.079
	Female	328	305.19	100103.50		

**p<0.05*

Table 3 shows that gender leads to significant differences in the students' scores for the Dimension 1 "Scientific knowledge is closed" (U= 44636.00, p<0.05) and Dimension 2 "Scientific knowledge is justified" (U= 45528.50, p<0.05). In the Dimension 1 "Scientific knowledge is closed", male students ($\bar{X}$=2.65) had higher scores than female students ($\bar{X}$=2.51). However, in the Dimension 2 "Scientific knowledge is justified", female students ($\bar{X}$=4.39) had higher scores than male students ($\bar{X}$=4.32). Besides, neither total scores (U= 46147.50, p>0.05) nor the scores for Dimension 3 "Scientific knowledge may change" (U= 47581.00, p>0.05) are not affected by gender.

The results of the Kruskal Wallis H-Test that was used in order to see if grade levels lead to any significance difference in the in total and sub-total scores are given in Table 4.

Table 4. *The Kruskal Wallis-H Test Results of Views towards Scientific Knowledge According to Grade Level Variable*

	Grade Level	*N*	*Means of rank*	*df*	χ^2	*p*	*Significant difference (p<0.0167)*
Scientific Knowledge is Closed	6.grade	212	289.17	2	18.072	0.000*	6-8, 7-8
	7.grade	206	302.30				
	8.grade	216	359.80				
Scientific Knowledge is Justified	6.grade	212	343.66	2	11.810	0.003*	6-8
	7.grade	206	325.00				
	8.grade	216	284.68				
Scientific Knowledge may Change	6.grade	212	313.42	2	0.273	0.872	-
	7.grade	206	316.54				
	8.grade	216	322.42				
Total	6.grade	212	301.23	2	7.332	0.026*	6-8
	7.grade	206	305.67				
	8.grade	216	344.75				

**p<0.05*

As can be seen in Table 4, shows that gender leads to significant differences in the students' scores for the Dimension 1 "Scientific knowledge is closed" ($\chi^2(2)= 18.072$, $p<0.05$), Dimension 2 "Scientific knowledge is justified" ($\chi^2(2)= 11.810$, $p<0.05$) and total scores ($\chi^2(2)= 7.332$, $p<0.05$). The results of the Mann Whitney-U test showed that in Dimension 1 the difference is between 8th graders and other groups in favor of 8th graders. In Dimension 2, the difference is between 6th graders ($\bar{X}$=4,43) and 8th graders ($\bar{X}$=4,28) in favor of the former group. In total scores, the difference is again between 6th graders ($\bar{X}$=3,37) and 8th graders ($\bar{X}$=3,45) in favor of the latter group. The scores for Dimension 3 "Scientific knowledge may change" are found to be not affected by grade levels ($\chi^2(2)= 0.273$, $p>0.05$).
The results of the Kruskal Wallis H-Test that was used in order to see if income levels of the families lead to any significance difference in the in total and sub-total scores are given in Table 5.

Table 5. *The Kruskal Wallis-H Test Results of Views towards Scientific Knowledge According to Income Level of The Students' Families Variable*

	Income Level of The Students' Families	*N*	*Means of rank*	*df*	χ^2	*p*	*Significant difference (p<0.0167)*
Scientific Knowledge is Closed	1.High	278	367.44	2	36.925	0.000*	1-2,1-3
	2.Medium	159	279.18				
	3.Lower	197	277.96				
Scientific Knowledge is Justified	1.High	278	344.98	2	18.754	0.000*	1-3,2-3
	2.Medium	159	325.20				
	3.Lower	197	272.51				
Scientific Knowledge may Change	1.High	278	341.32	2	11.619	0.003*	1-3
	2.Medium	159	317.60				
	3.Lower	197	283.80				
Total	1.High	278	381.00	2	63.169	0.000*	1-2,1-3
	2.Medium	159	288.11				
	3.Lower	197	251.61				

**p<0.05*

Table 5 shows that income level of families significantly affects the students' total scores and sub-dimensions scores on the scale of views towards scientific knowledge ($p<0.05$). The results of the Mann Whitney-U test indicated that for the Dimension 1 "Scientific knowledge is closed" students from the families with higher levels of income have higher scores than those from families with median levels or lower levels of income. Regarding the mean scores for Dimension 2 "Scientific knowledge is justified" it is found that there is a significant difference between those students from families with lower levels of income and those from other two categories of family income and that the difference is in favor of the latter groups. Concerning the mean scores for Dimension 3 "Scientific knowledge may change it is found that there is a significant difference between those students from families with lower levels of income and those from families with higher levels of income and that the difference is in favor of the latter group. In regard to the overall the mean scores it is found that there is a significant difference among three groups and that the difference is in favor of those from families with higher levels of income.

The results of the Spearman Brown correlation that was used in order to see if academic achievement correlated with views towards scientific knowledge and in the attitude scale are given in Table 6.

Table 6. *Results of Spearman Brown Correlation*

	Academic Achievement			*Scientific Attitude Total*		
	N	*(rho)*	*p*	*N*	*(rho)*	*p*
Scientific Knowledge is Closed	634	0.266	0.000*	634	0.255	0.000*
Scientific Knowledge is Justified	634	0.269	0.000*	634	0.300	0.000*
Scientific Knowledge may Change	634	0.179	0.000*	634	0.266	0.000*
Total	634	0.417	0.000*	634	0.433	0.000*

*$p<0.05$

Table 6 indicates that the academic achievement of the students are positively and significantly related to both their total scores in the views towards scientific knowledge scale ($r=0.417$, $p<0.05$) and their total scores in the scientific attitude scale ($r=0.433$, $p<0.05$) at a median level. In the study, an absolute value of correlation coefficient of 1.00 to 0.70 is defined as "High", 0.69 to 0.30 as "Medium" and 0.29 to 0.00 as "Weak" level correlation (Büyüköztürk, 2008).

It is found that there is a weak, positive and significant correlation between their academic achievements and their scores for the Dimension 1 "Scientific knowledge is closed" ($r=0.266$, $p<0.05$) and between these scores and their scientific attitude scores ($r=0.255$, $p<0.05$). Regarding the scores for Dimension 2 "Scientific knowledge is justifiable" and their academic achievements again a weak, positive and significant correlation was found ($r=0.179$, $p<0.05$). A median, positive and significant correlation was found between their mean scores for Dimension 2 and their scientific attitude scores ($r=0.300$, $p<0.05$). A weak, positive and significant correlation was also found between their mean scores for Dimension 3 "Scientific knowledge may change" and their academic achievement ($r=0.269$, $p<0.05$) and between their mean scores for the dimension and their scientific attitude scores ($r=0.266$, $p<0.05$).

DISCUSSION & CONCLUSION

In the study, it is found that views of the students towards scientific knowledge are near to positive level. It means that students believe that scientific knowledge may change, is based on authority and not absolute. It also indicates that for them scientific knowledge is produced through a process of experiments and asking questions. Kaya, Afacan, Polat and Urtekin (2013) found that while almost half of the students in all grades claim that scientific knowledge can change in course of time, the rest think that it does not. Muşlu (2008) concluded that primary education students' have contemporary views towards the nature of science. Demir, Kartal, Yalvaç and Öztürk (2010) found that primary education students' have nearly positive views towards scientific knowledge. Savaş (2011) found that basic education students' level of views towards scientific knowledge is high. Özmusul (2012) concluded that secondary students' have mostly median levels of views towards scientific knowledge. Therefore, it is safe to argue that the present finding is generally consistent with previous findings. However, there is also research, indicating that students' views towards scientific knowledge are mostly at lower levels, near to tradition perspectives (Carey, Evans, Honda, Jay & Unger, 1989; Küçük & Küçük, 2011; Yenice & Saydam, 2010). For instance, Yenice and Saydam (2010) found that 8th grade students' views towards scientific knowledge are unstable. Yenice and Özden (2013) found that scientific epistemological beliefs of 8th grade students' are closer to sophisticated beliefs and mid-level. Küçük and Küçük (2011), on the other hand, concluded that secondary students' views towards scientific knowledge are insufficient. The inconsistency between the current findings and those mentioned above may be resulted from using different participant groups.

In the study, it is found that gender of students significantly affects their views in regard to Dimension 1 "Scientific knowledge is closed" and Dimension 2 "Scientific knowledge is justifiable", but gender is found

to have no significant effect on Dimension 3 "Scientific knowledge may change". In Dimension 1, male students had higher scores, while in Dimension 2 female students attained higher scores. The difference in the scores in Dimension 2 shows that female students are much more eager to ask question and focus on causal relations. Balantekin (2013) found that according to the students' gender there was a significant difference in favor of female students in sub-dimension "Scientific Knowledge is justified" but in other sub-dimensions there was not. Çelikdemir (2006) found that the views towards the subjectivity of scientific knowledge changes based on gender. More specifically, female students have higher scores in this regard. Uzun (2011) concluded that the students' scores on the Dimensions 2 and 3 are not significantly affected by their gender, but another dimension "Scientific knowledge is subjective" is significantly affected by gender in that male students have higher scores on this dimension. Similarly, Özmusul (2012) found that the students' scores on the Dimensions 2 and 3 are not significantly influenced by their gender, but in the Dimension 1 "Scientific knowledge is closed" female students had higher scores. Therefore, the current findings are partly supported by previous findings given above. However the studies carried out by Conley, Pintrich, Vekiri and Harrison (2004), Doğan and Abd-El-Khalick (2008), Küçük and Küçük (2011), Yalvaç, Öztürk and Sarıkaya (2010), Yankayış, Güven and Türkoğuz (2014), Yenice and Saydam (2010) and Yiğit et. al. (2010) concluded that views towards scientific knowledge were not related to gender. This inconsistency between findings may be resulted from the use of different participant groups and different data analysis tools.

In the study, it is found that grade levels of students do not have any statistically significant effect on their scores from the Dimension 3 "Scientific knowledge may change". However, grade level is found to have significant effects on their scores from the remaining two dimensions. More specifically, for Dimension 1 "Scientific knowledge is closed" 8th grade students had higher scores in contrast to 6th and 7th grade students. Regarding Dimension 2 "Scientific knowledge is justifiable" 6th grade students had higher scores. Scientific attitude scores of the students also varied based on their grade levels in that the scores of 6th grade students and those of 8th grade students statistically significantly different in favor of the latter group. As a whole these findings suggest that higher grade level more positive student views towards scientific knowledge. It may be a result of the newly implemented program of science and technology course, which has been in effect since 2005. Yankayış, Güven and Türkoğuz (2014) found that the students' views towards scientific knowledge changes based on grade level. Balantekin (2013) found that there was a significant difference in favor of the 7th and 8th classes in sub-dimension "Scientific Knowledge is Closed". Çelikdemir (2006) found that 8th grade students have realist views towards the changeability, subjective nature and uncertainty of scientific knowledge, while 6th grade students have realist views towards the role of observations and inferences in science. Therefore, it can be argued that students' views towards the nature of science and scientific knowledge significantly vary based on their grade level. However, Kang et. al. (2005), Küçük and Çepni (2006), Küçük and Küçük (2011) and Yiğit et. al. (2010) concluded that grade level does not significantly affect the students' views towards scientific knowledge.

The findings of the study also indicated that income level of families significantly affect the students' views towards scientific knowledge. More specifically, those students from families with higher levels of income have much more positive views towards the scientific knowledge. This finding may reflect the fact that such families can provide much more useful opportunities for their children. There is limited number of studies dealing with the effects of income levels of families on children's views towards scientific knowledge. One of such studies was carried out by Yiğit et al. (2010) with a sample of secondary students. They concluded that income level of students' families has significant effects on their scores on all sub-dimensions of the scale of views towards scientific knowledge. More specifically higher the income level

more positive the students' views towards scientific knowledge. Uzun (2011) found that income level significantly affected the views of 5th grade students towards the changeability of scientific knowledge. This finding is consistent with the findings of the studies given above.

It is also found that the academic achievement of the students are positively and significantly related to both their total scores in the views towards scientific knowledge scale and their total scores in the scientific attitude scale at a median level. It is determined that there is a weak, positive and significant correlation between their academic achievements and their scores for the Dimension 1 "Scientific knowledge is closed" and between these scores and their scientific attitude scores. Regarding the scores for Dimension 2 "Scientific knowledge is justifiable" and their academic achievements again a weak, positive and significant correlation was found. A median, positive and significant correlation was found between their mean scores for Dimension 2 and their scientific attitude scores. A weak, positive and significant correlation was also found between their mean scores for Dimension 3 "Scientific knowledge may change" and their academic achievement and between their mean scores for the dimension and their scientific attitude scores. Research suggests that academic achievement of the students and their views towards scientific knowledge are significantly correlated (Conley et. al. 2004; Doğan & Özcan 2010; Küçük & Küçük 2011; Özmusul 2012; Özden & Yenice, 2014; Uzun 2011; Yankayış, Güven & Türkoğuz, 2014; Yiğit et. al. 2010). Yankayış, Güven and Türkoğuz (2014) found that there were significant differences between the secondary school students' views towards scientific knowledge in relation to their academic achievement. Özmusul (2012) found that those students with higher levels of academic achievement have higher scores on the dimensions of "Scientific knowledge is justifiable" and "scientific knowledge may change". Özden and Yenice (2014) found that scores of the secondary school students' in the scale of views about scientific knowledge are positively correlated with their academic achievement and their scores in the scale of scientific attitude. It can be stated the current findings are consistent with the previous findings. Since there is limited study discussing the relationship between secondary school students' views towards scientific knowledge and their scientific attitudes, it can be argued that the current study is significant.

Based on the findings of the study, the following suggestions are developed for teachers and future studies.

- Activities to improve the students' views towards scientific knowledge can be carried out not only in science and technology courses, but also in other courses.
- It is found that when the students' views towards scientific knowledge are more positive, their academic achievement and scientific attitudes are also positive. Therefore, science teachers may periodically use activities to improve the students' views towards scientific knowledge.
- In the current study, the students' views towards scientific knowledge and their attitudes towards science were quantatively analyzed taking into account such variables as gender, grade level and others. The same study can be carried out using a qualitative approach to see more detailed effects of the variables.

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