International Journal on New Trends in Education and Their Implications
July, August, September 2011 Volume: 2 Issue: 3 Article: 1 ISSN 1309-6249

MIDDLE SCHOOL STUDENTS' ATTITUDE TOWARD SCIENCE IN CONSTRUCTIVIST CURRICULUM ENVIRONMENT

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ABSTRACT

The purpose of this study was to investigate middle school students' attitude toward science and the effect of gender, grade level and parent education level on students' attitude toward science. The sample of this survey study included 2961 sixth, seventh and eighth grade middle school students in Çankaya, Ankara. Students completed 40 items test of science related attitude (TOSRA) developed by Fraser (1978). Four dimensions (adaptation of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science) were selected for this study. Descriptive analyses revealed that, regarding the mean scores of each TOSRA dimension, students were undecided about all sub-dimensions of attitude. MANOVA results showed that grade level significantly affected middle school students' attitude toward science regarding adaptation of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science. Gender and parents education level have influence on only adaptation of scientific attitudes dimension.

Keywords: Attitude toward science, Constructivist Curriculum Environment

INTRODUCTION

Student attitudes toward science have been discussed for several decades within different research contexts. Developing positive attitude toward science regardless of individual difference is one of the purposes of science education (Arısoy, 2007; Azizoğlu & Cetin, 2009). Attitude can be defined as "feelings, beliefs and values held about the enterprise of school science, science and the impact of the science on society" (Osborne, 2003, p.1050). Literature and meta-analyses studies revealed that gender difference is important factor revealing the differences in terms of students' attitude toward science (Weinburgh, 1995). Most of the studies reported that compared to the girls, boys had more positive attitudes toward science (Jones, Howe, & Rua, 2000; Jovanovic & King, 1998). Grade level is another student characteristic investigated in terms of students attitude. Some of the findings revealed the negative relationship between grade level and students attitude

toward science (Hofstein, Maoz, & Rishpon, 1990, Oh & Yager, 2004). Oh and Yager (2004) stated that while students negative attitudes toward science are related to traditional approach in science instruction, students' positive feelings toward science are associated with constructivist science classrooms. Authors also mentioned that if students are thought more scientific information, students will have more negative attitude. Therefore they suggest learning environment should be designed to provide students to attain scientific knowledge and gain more positive attitude toward science. Therefore in Turkey the last science curriculum development effort was developed in 2004 started to be implemented nationwide in all elementary schools in 2005-2006 academic years. Science is the way of inquiry which based on logical thinking and permanent investigation. In the current curriculum some important features are emphasized. According to current curriculum, scientific method includes observation, stating hypotheses, collecting data, testing hypotheses, rejecting or accepting hypotheses, and interpreting data. It is stated that Imagination, creativity, objectivity, inquiry, and being openness to new ideas are all important in scientific processes. In science and technology education students should learn the way of attaining knowledge. When students learn new things through discovery, they should reconstruct their knowledge again. Also in the curriculum it is emphasized that knowledge in science is not constant but it is the best explanation known. Moreover, the current curriculum aims creating awareness of scientific methods in addition to scientific literacy per se. When these features are considered, the current science and technology curriculum embraces a "constructivist approach". However, the previous science curriculum was student-centered and focused on the scientific method and investigation processes. However one of the most important differences between the current curriculum and the previous one is that, while the current curriculum has a spiral structure, the previous curriculum had a linear structure. In science and technology curriculum most of the subjects took place in all grade level from simple to complex. In this way students remember subjects rather frequently and they reinforce their learning.

The purpose of this study was to investigate middle school students' attitude toward science and to determine the effect of gender, grade and parents education level on students' attitude toward science.

METHODOLOGY

This study is survey design study. The sample included 2961 students enrolled in sixth, seventh, and eighth grade in elementary schools located in the Çankaya district one of the largest districts in Ankara. Students completed test of science related attitude (TOSRA) developed by Fraser (1978). TOSRA included 5 likert type 70 items with seven subscales namely: social implication of science, normality of scientists, attitudes toward inquiry, adaptation of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science. However of these subscales 40 items and four dimensions (adaptation of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science) were selected for this study. Reliability of this instrument was reported as .78 by Fraser (1978). TOSRA was translated and adapted into Turkish by Arısoy (2007) and alpha coefficients of these sub dimensions were reported .64, .85, .82, and .78 respectively.

RESULTS

Descriptive analyses revealed that, regarding the mean scores of each TOSRA dimension, students were undecided about all sub-dimensions of attitude with the values of adaptation of scientific attitudes (M=3.64, SD=.66), enjoyment of science lessons (M=3.69, SD=.87), leisure interest in science (M=3.46, SD=.84), and career interest in science (M=3.40, SD=.81).

MANOVA was conducted to investigate the effect of gender, grade and parents education level on students' attitude toward science. MANOVA results for students' attitude toward science were presented in Table 1.

Table 1: MANOVA Results for Students Attitude toward Science

	df	F	p
Adaptation of scientific attitudes			
Gender	1	13.89	.000*
Grade level	2	4.59	.010*
Parent Education level	1	4.07	.017*
Enjoyment of science lessons			
Grade level	2	6.35	.002*
Leisure interest in science			
Grade level	2	17.8	.000*
Career interest in science			
Grade level	2	7.91	.000*

* p< 0.05

Results revealed that grade level had significant main effect on middle school students' attitude toward science regarding adaptation of scientific attitudes, enjoyment of science lessons, leisure interest in science, and career interest in science ($F(2, 2943) = 4.59$, $p < .000$; $F(2, 2943) = 6.35$, $p < .000$; $F(2, 2943) = 17.8$, $p < .000$; $F(2, 2943) = 7.91$, $p < 0.000$ respectively). Gender and parents education level has influence on students' attitude toward science with respect to only adaptation of scientific attitudes dimension ($F (1, 2943) = 13.89$, $p< .000$; $F (2, 2943) = 4.07$). Male students (M=3.70 SD=0.26) had higher score than female students regarding adaptation of scientific attitudes.

Follow-up post hoc analyses were conducted to identify where the significant differences were for grade level and parents education level. In terms of adaptation of scientific attitudes and enjoyment of science lessons eighth grade students' responses had significantly lower mean scores than the sixth and seventh grade students. Concerning leisure and career interest in science the mean scores of sixth, seventh and eighth grade students were significantly different from each other. Moreover students having different parents' education level had different score related adaptation of scientific attitudes. Bonferroni test results, as a pair wise comparison, are presented in Table 2.

Table 2: The Bonferroni Test Results for Mean Scores at Different Grade Levels and Parent Education Level

	Mean Scores			
	adaptation of scientific attitudes	enjoyment of science lessons	leisure interest in science	career interest in science
Grade Level				
6th graders	3.68^{a*}	3.76^{a*}	3.57^{a*}	3.47^{a*}
7th graders	3.69^{a*}	3.68^{a*}	3.43^{b*}	3.39^{b*}
8th graders	3.53^{b*}	3.51^{b*}	3.20^{c*}	3.22^{c*}
Parent Education Level				
Primary-Secondary school	3.56^{a*}	3.61^{a*}	3.40^{a*}	3.33^{a*}
Undergraduate	3.64^{b*}	3.65^{a*}	3.41^{a*}	3.35^{a*}
Graduate	3.69^{c*}	3.69^{a*}	3.40^{a*}	3.40^{a*}

Means with similar letters (a, b) are not significantly different from each other; means with different letters (a, b) are significantly different from each other.

DISCUSSION CONCLUSION AND IMPLICATION

Results of this study revealed middle school students' attitudes toward science were not respectable level. With respect to gender male students hold more positive attitudes regarding adaptation of scientific attitudes than female students. This finding might be related to extracurricular activities that male students interested in. Zimmerman and Bennett (1987) indicated that male students were more interested in doing science experiments than female students. In the literature as some studies support this findings (Catsambis, 1995; Greenfield, 1996; Jones, Howe, & Rua, 2000), there are also some contradictory findings (Catsambis, 1995; Dhindsa & Chung, 2003; Miller, Lietz & Kotte, 2002). Results also showed that when education level of parents' increased, their children' attitude regarding adaptation of scientific attitudes scores also increased. Based on their knowledge and experiences, parents with higher educational degrees could better coach their children in motivating to learn and increasing their adaptation of scientific attitudes.

Regarding grade level, students' attitude toward science has decreased with the increasing grade level. Hofstein, Maoz, and Rishpon (1990), Yager and Penick, (1986) and Weinburgh (1994) supported these findings and proposed that grade level was a significant predictor of student attitudes toward science. In the national exam system in Turkey, where, generally, students take exams at the end of each grade level of elementary school that enable them to enroll in one of the prestigious high schools. Studies conducted by one of Turkish educational community 58.7 % of the students reported that they did not want national exam after 6^{th}, 7^{th} and 8^{th} grade level. Since 47% of the students thought that being exams at the end of the each year lead to tension increasing anxiety. Therefore students had negative attitude toward science with the increasing grade level, even if they had constructivist learning environment for their science courses. Half percentages of the students take extra courses while getting ready for national exam. While they were studying for this exam, students did not give importance social, cultural and leisure time activities raising their stress. Aydın (2001) supported that as the number of exam which students enter increases, their tension and disadvantage of the exams also increases. Students' academic achievement should be considered rather than these exams while entering secondary school as supported by Özyürek (2010)

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