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An investigation of ninth grade students' attitudes toward daily life chemistry

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The purpose of this study is to examine the attitudes towards chemistry of everyday life of high school ninth grade students according to sex/gender, learning/educational level of mother and father, father's profession, and income level of as variables. Survey method has been utilized in research. The sample of the study is composed of a total of 159 ninth grade students from 2012-2013 academic year second term in an Anatolia High School in Kütahya city centre in Turkey. Data from the study were collected with "Attitude Scale Towards Daily Life Chemistry Scale" which consists of 25 items on the five-point Likert type. The Cronbach Alpha reliability coefficient of the scale was calculated to be .88. Analysis of the data was utilized for Independent Samples t-test, one-way ANOVA, to determine the difference between the groups Tukey's HSD test. According to the results of the study, students' attitudes towards Daily Life Chemistry by gender, mother's learning level, and income level variables were found to be the difference. In additon, Gender variable between female and male students' attitudes towards daily life chemistry have been determined to have a statistically significant difference in favor of female students.

Key words: Daily life chemistry scale, attitude, gender, ninth grade students', educational level of mother and father.

INTRODUCTION

The science classes aim at ensuring that individuals handle and scientifically examine the universe they live in and adapt easily to life, because in today's world, the information age is experienced very rapidly. They also aim to ensure that people well observe the environment they exist in and learn ways of obtaining results by establishing cause and effect relationship between events as far as possible (Kaptan and Korkmaz, 2001). This goal can be achieved through science classes by providing students with not only the information pertaining

to their fields of use but also the information necessary for them to suggest solutions for the problems they might encounter in daily life, and by raising them as science literate individuals who are engaged in scientific and technological developments (Pınarbaşı et al.,1998). Furthermore, it is necessary for students to be able to establish good relationship between the concepts they learn at school with the events affecting their own lives (Ayas and Özmen, 1998; Çoştu and Ayas, 2005).

While carrying out the chemistry lessons, which is one

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of the science classes, the theoretical and practical methods regarding chemistry are used, and thus the necessary behavior changes are tried to be developed in the students (Yücel et al., 2001). The students associate the knowledge and skills they obtain in the chemistry class to different situations in life, and thus contribute to their upbringing as individuals who are sensitive and conscious about the protection of their own health and environment (Ministry of National Education [MNE], 2013). It is a fact that almost all the topics included in the chemistry classes are either related to daily life events or they are the results of daily life events. It is stated that associating the chemistry topics to daily life will contribute to the following: providing a good motivation for students, ensuring that they understand the information better by applying it to different situations, increasing their levels of adaptation to daily life thus helping them lead happier lives, raising awareness about the environment (Pınarbaşı et al., 1998), and forming a positive attitude towards daily life chemistry (Koçak and Önen, 2012a).

The literature covers many studies focusing on how students relate the concepts they learn in science courses (physics, chemistry, biology) to daily life. Some researchers (Anagün et al., 2009; Balkan et al., 2011; Coştu et al., 2007; Dede-Er et al., 2013; Hürcan and Önder, 2012; Koçak and Önen, 2012a; Özmen, 2003; Taşdemir and Demirbaş, 2010; Ürek and Dolu, 2013; Yadigaroğlu and Demircioğlu, 2012; Yiğit et al., 2002). Coştu et al., 2007) conducted a study analyzing the relations between the students' understanding of science concepts and daily life events in order to determine the effectiveness of an education enriched with group discussions compared to the conventional approach, by using a quasi-experimental method. This study reported that the experiment group was successful at a statistically significant level compared to the control group in terms of interpreting daily life events. Ürek and Dolu (2013) carried out a study in order to identify the knowledge levels of prospective teachers regarding the daily life materials containing various elements and compounds, and they found that the prospective teachers did not have adequate knowledge on the daily life chemicals. Yadigaroğlu and Demircioğlu (2012) performed a study in order to find out to what extent the prospective chemistry teachers can associate their chemistry knowledge to daily life events, and their study identified that the prospective chemistry teachers had difficulty in relating their chemistry knowledge to daily life events. Yiğit et al. (2002) conducted a study in order to determine to what extent secondary school 8th grade students associate the science concepts to events and phenomena, and in this study, they detected that the students cannot evaluate and interpret the science concepts (physics-chemistry-

biology) at an adequate level in their minds scientifically and that they had a highly low level of relating those concepts to daily life. Özmen's (2003) study aimed at finding to what extent the prospective chemistry teachers can use their knowledge of acid-base concepts for explaining the acid-base events encountered in daily life, and this study revealed that the students could not use the information they learned during their education regarding the acid-base concept, which is one of the most important concepts of chemistry, at a desired level for explaining the acid-base events encountered in daily life. Hürcan and Önder (2012) carried out a study to determine to what extent the primary school seventh grade students associate the science concepts they learned in the Science and Technology Class to daily life, and they reported that the students' level of relating the concepts they learned to daily life was not at the desired level. Balkan et al. (2011) conducted their study in order to determine to what extent prospective science teachers associate the scientific information to their daily lives, and they found that the prospective teachers could relate their scientific information regarding physics to their daily lives to a large extent, while they could relate their scientific information regarding chemistry and biology with their daily lives partially. Dede-Er et al. (2013) conducted a study with the aim of detecting to what extent the students associate what they learn about the topics included in 'Electricity in Our Lives Unit' in the Science and Technology Class to their daily lives and finding the relation between the students' scientific process skills and their level of associating them to their daily lives. They found that the students failed to fully associate the information they received in 'Electricity in Our Lives Unit' to daily life and that their level of associating this information to daily life increased as their scientific process skill levels increased. Koçak and Önen (2012) evaluated the basic chemistry knowledge regarding Chemical Changes Unit of the secondary education ninth grade students, with the alternative activities designed according to 5E model of which subject is daily life chemistry. They examined the effects of those activities on students' motivation for chemistry class, their attitudes towards daily life chemistry and success in chemistry, and they found that when chemistry course was correlated with daily life, there was a positive increase in students' attitude towards daily life chemistry and motivation for chemistry course.

When these studies are examined, it is seen that while they focus on how students associate the scientific knowledge/science concepts they learn to daily life, there are scarcely any studies focusing on their attitudes towards daily life chemistry. In the light of this information, this study aims to examine the ninth grade

students' attitudes towards daily life chemistry according to the variables of gender, the educational status of parents, father's occupation, and income level. In line with this target, answers were sought for the following questions:

1. Do the ninth grade students' attitudes towards daily life chemistry change according to gender?
2. Do the ninth grade students' attitudes towards daily life chemistry change according to the educational status of mother?
3. Do the ninth grade students' attitudes towards daily life chemistry change according to the educational status of father?
4. Do the ninth grade students' attitudes towards daily life chemistry change according to father's occupation?
5. Do the ninth grade students' attitudes towards daily life chemistry change according to income status?

METHOD

The quantitative research design used in this study was the survey method. The study sample consisted of 159 students (85 females and 74 males) studying at the ninth grade of an Anatolian High School at the city center of Kütahya Province in Turkey in the second semester of the academic year of 2012-2013. The study group was determined through convenience sampling, which is one of the non-random sampling methods.

Data collection tool

The data collection tool used in this study was "Daily Life Chemistry Attitude Scale (DLCAS)", which was developed by Koçak and Önen (2012a). This scale is based on a five-point Likert scale consisting of 25 statements and five factors, and the Cronbach's Alpha reliability coefficient was found as .880. In this study, the Cronbach's Alpha reliability coefficient of the measurement obtained from the scale was found as .918. The items included in the scale were: Importance, Antipathy, Chemistry and Daily life, Experiment and Daily Life, and Awareness. The scale included 14 statements supporting (positive) daily life chemistry and 11 statements not supporting (negative) daily life chemistry. While evaluating "Daily Life Chemistry Scale" the negative statements were rated as: Strongly agree=1, Agree=2, Neither agree nor disagree=3, Disagree=4, Strongly disagree=5; and the positive statements were rated as: Strongly agree=5, Agree=4, Neither agree nor disagree=3, Disagree=2, Strongly disagree=1. Necessary permits from baseline Kutahya Provincial National Education Directorate were taken and passed the application stage. DLCAS the media class students considering a voluntary basis by the researchers was applied for 20 min.

Data analysis

The data collected in the study were analyzed by using the statistic package program. In data analysis, independent sampling t-test was used in order to identify whether there was a significant difference between daily life attitudes according to the gender variable. One-way analysis of variance (ANOVA) was used in order to identify whether there was a significant relation in terms of the variables of the educational status of parents, father's occupation, and income status; and Tukey's HSD test was used to test the difference.

FINDINGS

This section makes a statistical analysis of the results obtained from the Daily Life Chemistry Attitude Scale and interprets them.

Table 1 indicates that there was a significant difference between gender and daily life chemistry attitudes [$t(157)=3.14$, $p=.002$]. In other words, the attitudes towards daily life chemistry differed significantly according to gender. The average of the total scores of female students' attitudes towards daily life chemistry (-Mean$_F$ =90.42) was higher compared to the male students (Mean$_M$= 81.58). The average scores indicate that female students attitudes towards daily life chemistry were more positive compared to the male students' attitudes.

Independent t-test was applied in order to determine whether the items included in the Daily Life Chemistry Scale change according to gender, and the results are indicated in Table 2.

When the items of the Daily Life Chemistry Scale are examined separately, it is seen that there was a significant difference between genders in terms of importance, antipathy, chemistry and daily life, and that there was not a significant difference between genders in terms of experiment and daily life, and awareness. It is seen that there was a positive difference between genders in favor of female students in the item of importance ($t(157)=2.36$, $p=.019$). This result indicates that female students had a more positive approach to the daily life chemistry in terms of importance compared to the male students. In addition, it is seen that there was a positive difference between genders in favor of female students in the item of antipathy ($t(157)=2.83$, $p=.005$). This result indicates that female students had a more positive approach to the daily life chemistry in terms of antipathy compared to the male students. Furthermore, it is seen that there was also a positive difference between genders in favor of female students in the item of chemistry and daily life ($t(157)=3.73$, $p=.000$). This result indicates that female students had a more positive approach to the daily life chemistry in terms of chemistry and daily life compared to the male students.

One-way ANOVA was used to test whether the attitudes of the ninth grade students towards daily life

Table 1. Dependent t-test results of daily life chemistry scale scores according to gender.

	Group						95% CI for Mean Difference		
	Male			Female					
	M	SD	n	M	SD	n		t	df
DLCAS	81.58	18.95	74	90.42	16.48	85	3.29, 14.39	3.14*	157

*p< .05.

Table 2. Independent t-test results of daily life chemistry scale factor scores according to gender.

Sub-scales of DLCAS	Group						95% CI for Mean Difference	t	df
	Female			Male					
	M	SD	n	M	SD	n			
Importance	22.68	5.11	85	20.66	5.66	74	.33, 3.70	2.36*	157
Antipathy	20.34	6.24	85	17.58	5.98	74	.83, 4.68	2.83*	157
Chemistry and daily life	18.55	4.43	85	15.87	4.58	74	1.25, 4.08	3.73*	157
Experiment and daily life	17.74	2.91	85	14.25	3.51	74	-.52, 1.49	.95	157
Awareness	14.10	3.16	85	13.20	4.22	74	-.25, 2.06	1.53	157

*p< .05.

Table 3. Daily life chemistry attitude averages according to the educational status of parents.

	Groups	n	Mean	SD
The educational status of mother	Primary school(P)	79	90.291	17.280
	Secondary education(S)	54	82.055	18.857
	University and above(U)	26	83.038	17.305
	Total	159	86.308	18.164
The educational status of father	Primary school	34	88.970	20.080
	Secondary education	62	89.112	16.579
	University and above	63	82.111	18.059
	Total	159	86.308	18.164

chemistry changed according to the educational status of parents, and the results are indicated in Tables 3 and 4.

Table 4 indicates that there was a statistically significant difference between the total scores of the students' attitudes towards daily life chemistry and the educational status of their parents [F(2-156)=3.942; p< .05]. As a result of the Tukey's HSD multiple comparison test, which was performed to identify between which groups this significant difference existed, it was seen that the significant difference existed between the scores of students whose mothers' educational status was primary school and those whose mothers' educational status was secondary education. In other words, students whose mothers' educational status was primary school (Mean$_P$ =90.291) had a more positive attitude towards daily life

chemistry compared to the students whose mothers' educational status was secondary education (Mean$_P$ =82.055). On the other hand, there was not a statistically significant difference between the total scores of the students' attitudes towards daily life chemistry and the educational status of their fathers [F(2-156)=2.851; p>.05]. In other words, students' attitudes towards daily life chemistry did not change significantly according to the educational status of their fathers.

One-way ANOVA was used to test whether the attitudes of the ninth grade students towards daily life chemistry changed according to father's occupation, and the results are indicated in Tables 5 and 6.

Table 6 indicates that there was not a statistically significant difference between the total scores of the

Table 4. One-way ANOVA results of daily life chemistry attitude scores according to the educational status of parents.

	Source	df	SS	MS	F	p	Difference
	Between groups	2	2507.801	1253.900			
Mother's educational status	Within groups	156	49626.099	318.116	3.942	.021*	P-S
	Total	158	52133.899				
	Between groups	2	1838.497	919.248	2.851	.061	
Father's educational status	Within groups	156	50295.402	322.406			-
	Total	158	52133.899				

*p< .05

Table 5. Daily life chemistry attitude averages according to father's occupation.

	Groups	n	Mean	SD
	Civil servant	52	85.557	16.615
	Worker	38	90.815	18.647
Father's occupation	Self-employment	48	83.854	19.324
	Retired	21	85.619	18.078
	Total	159	86.308	18.164

Table 6. One-way ANOVA results of daily life chemistry attitude scores according to father's occupation.

	Source	df	SS	MS	F	p	Difference
	Between groups	3	1100.430	366.810	1.114	.345	
Father's occupation	Within groups	155	51033.469	329.248			
	Total	158	52133.899				

Table 7. Daily life chemistry attitude averages according to the variable of income level.

	Groups	n	Mean	SD
	0₺- 1000₺*	33	92.848	18.668
	1001₺- 2000₺	65	86.815	17.045
Income level	2001₺ and over	61	82.229	18.231
	Total	159	86.308	18.164

*Turkish lira.

students' attitudes towards daily life chemistry and their fathers' occupation [F(3-155)=1.114; p>.05]. In other words, students' attitudes towards daily life chemistry did not change significantly according to the occupation of their fathers.

One-way ANOVA was used to identify whether the attitudes of the ninth grade students towards daily life chemistry changed according to the income level, and the analysis results are indicated in Tables 7 and 8.

Table 8 indicates that, as a result of the one-way analysis of variance, which was performed according to the income levels of the students, there was a significant difference between the scores of the students' attitudes towards daily life chemistry [F(2-156)=3.835; p< .05]. Tukey test indicates that a significant difference existed between the students whose income level was 0-1000 ₺ and those whose income level was 2001₺ and above. In other words, the students whose income level was 0₺ - 1000₺ (Mean=92.84) had more a positive attitude towards daily life chemistry compared to the students

Table 8. One-way ANOVA results of daily life chemistry attitude scores according to the variable of income level.

	Source	df	SS	MS	F	p	Difference
	Between groups	2	2443.085	1221.543			
Income level	Within groups	156	49690.814	318.531	3.835	.024*	0-1000 ₺-2001₺ and over
	Total	158	52133.899				

*p< .05.

whose income level was ₺ 2001 and above (Mean=61.200).

DISCUSSION AND CONCLUSION

This study aims at examining the ninth grade students' attitudes towards daily life chemistry according to the variables of gender, the educational status of parents, father's occupation, and income level. The following results were attained in the study:

It was found that there was a statistically significant difference between the students' attitudes towards daily life chemistry and gender, and that the female students had a more positive attitude towards daily life chemistry compared to the male students. This result shows parallelism with the results of Koçak and Önen (2012a).

It was found that there was a statistically significant difference between the students' attitudes towards daily life chemistry and their mothers' educational status. The students whose mothers' educational status was at primary school level had a more positive attitude towards daily life chemistry compared to the students whose mothers' educational status was secondary education. On the other hand, there was not a statistically significant difference between the students' attitudes towards daily life chemistry and their fathers' educational status.

There was not a statistically significant difference between the scores for students' attitudes towards daily life chemistry and their fathers' occupation.

There was a significant difference between the scores for students' attitudes towards daily life chemistry and the variable of income level. The students whose income level was ₺0-₺1000 had more a positive attitude towards daily life chemistry compared to the students whose income level was 2001₺ and above.

The following can be suggested based on the study results:

A difference was identified regarding the variable of gender and the attitude towards daily life chemistry. In order to analyze this difference further, different methods or approaches (5E model, Context Based Learning, Project Based Learning, and Argumentation etc.) and a

sample that covers the other grades of the secondary education can be utilized. It was found that the students whose mothers' educational status was at primary school level had a more positive attitude towards daily life chemistry compared to the students whose mothers' educational status was secondary education. The cause/s of this situation can be identified by conducting interviews with the students. A significant difference was found between the students' attitudes towards daily life chemistry and the variable of their income level. It was found that the students whose income level was 0₺-1000₺ had more a positive attitude towards daily life chemistry compared to the students whose income level was 2001₺ and above. The causes of this situation can be revealed by conducting interviews with the students. The teachers can guide students in order for them to be able to associate chemistry topics to the daily life by taking their attitudes towards daily life chemistry into consideration.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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