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EXAMINATION OF STUDENTS' ATTITUDES TOWARDS BIOLOGY AND BIOLOGY COURSE IN TERMS OF GENDER, GRADE LEVEL AND PET-KEEPING

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Abstract

Biology course can be difficult for students at times as it includes a lot of concepts and a relatively intense content. At this point, students' attitude towards biology and biology course is highly important because having developed a positive attitude would significantly affect behavior. In other words, those students who have developed a positive attitude towards biology and biology course are expected to be more interested in class, more enthusiastic for learning, and as a result more successful. In this research, the gender and grade level variables as well as the pet-keeping variable were examined. The effects of these variables on the attitudes of secondary school students towards biology and biology course were examined by MANOVA. The sample of the research, which was designed in a relational survey model, consisted of 1047 secondary school students. In the collection of data, "Secondary School Students' Attitude towards Biology and Biology Course Scale" was used. It was concluded that students who keep a pet have a more affirmative attitude. It was determined that female students have a more affirmative attitude compared to male students and 9th graders have a more affirmative attitude compared to students in other grade levels. Finally, it has been discussed why female students', pet keeping students' and lower grade students' attitudes towards biology and biology course are more affirmative, and suggestions for increasing students' attitudes have been developed.
Keywords: *attitude towards biology, biology course, secondary school students, pet-keeping behavior.*

Introduction

Though the definition of the "attitude" concept has been given variously, Thurstone (1967) described it as grading and ranking of positive or negative density towards a psychological object while Oppenheim (1992) gave the definition of it as the tendency to react against a stimulant either positively or negatively; and Özgüven (2004) defined it as a tendency or a state of being emotionally ready that is observed as either the admission or the rejection of a person, group, institution or an idea. Ülgen (1995) expresses that whereas gaining an attitude occurs through learning, it directs an individual's actions and can cause partiality during the decision-making process. Attitudes have been accepted as the most powerful descriptors of behaviors for a long time (Ajzen & Fishbein, 2005; Schiefele, 1990). For this reason, in the context of the research, the starting point has been the hypothesis defending that the students having affirmative attitudes towards biology course reflect it onto their actions in addition to their being more willing to learn biology.

Along with the fact that the roots of attitudes go back to the childhood, they are usually obtained through direct experiencing, reinforcement, imitation and social learning (Kağıtçıbaşı, 1999). As children grow up, the impact of adults upon children decrease while the impacts of other social factors increase specifically in adolescence period. Manners of a teenager aged 12-20 can be variable. The large part of an individual's manners take their last shapes in the first adulthood period between the ages of 20-30, later they either never change or slightly change (Morgan, 1995). Hence, the secondary school period at which students are between the ages of 12-20 is a convenient time to alter manners. In this period, via changing students' attitudes towards the desired direction and improving them, the teaching- learning process can also be supported. For this reason, secondary school students were chosen as the study group in the research.

Biology is closely associated with a lot of disciplines and it serves humanity in the fields of agriculture, industry, medicine, and pharmacy along with many more. Biology knowledge is seen as a precondition in terms of solving a lot of problems related to our daily lives, particularly environmental and health problems. For this reason, it is important for especially the young people to have the simple knowledge about biology, to gather and follow the improvements related to biology so that they can participate in a civilized society. At this point, biology course given in the scope of formal training is of huge importance. Today, based on this fact, the importance given to the biology course has increased and the studies towards enhancing the effectiveness and productivity of biology course have been accelerated. When the studies are examined, it is seen that the biology course is one of the most challenging courses for the students. Biology is one of the lessons that students fail most and have difficulty understanding (Chuang & Cheng, 2003; Çimer, 2012; Durmaz, 2004; Gül & Yeşilyurt, 2010; Kışoğlu, 2018; Yeşilyurt & Gül, 2009a). Research sign out the fact that students' attitudes towards biology course might have an effect on this situation (Chuang & Cheng, 2003; Çevik & Ekici, 2008; Mutlu, 2006; Sungur & Tekkaya, 2003). When the studies made in the field of biology education are examined, it can be seen that an essential part focuses on the attitudes (Chuang & Cheng 2003; Ekici & Hevedanlı, 2010; Gül & Yeşilyurt, 2010; Koçakoğlu & Türkmen, 2010; Nasr & Soltani, 2011; Prokop et al., 2007; Tosun, 2011, Usak et al., 2009). This case can be evaluated as an indicator of the attitude's effect on teaching process. Students' attitudes toward the course greatly affect their learning and accordingly, their academic achievement on the course (Pehlivan, 1994). At this point, the comment related to the fact that developing a positive attitude upon students about the biology course will increase their accomplishments can be made. Determining the factors that influence students' manners towards biology helps in developing the strategies related to enhancing their attention and enthusiasm about the course. Besides, revealing the students' attitudes towards biology via probing different variabilities is quite significant in terms of making them more successful and getting effective results in the teaching process. In the body of literature, there are a lot of assessment instruments developed to evaluate students' approaches towards biology (Atik et al., 2015; Koçakoğlu & Türkmen, 2010; Yeşilyurt & Gül, 2009b, Tosun, 2011). However, studies analyzing the activities and individual differences that can affect attitudes are needed further.

In the study conducted with elementary school students by Emre and Erten (2012), it has been identified that students were interested in pet-keeping and many of them wanted to have a pet. By deducing from the findings of the study, it has been advised that students be supported about their enthusiasms in terms of plants and animals, and there must be topics related to these issues in their curriculums. In this way, it has been asserted that students will love the nature more and protect it alongside their being actively- involved in the courses. Likewise, Berck and Klee (1992) defended the idea that especially people taking care of plants and pets in their childhoods become more susceptible towards the environmental issues around them in the later periods of their lives in their research. Moreover, it is known that students' being interested

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in the course stimulates their motivation and learning becomes easier (Erten, 2008). In short, while the findings of such studies display that students take interest in looking after a pet, it also raises a question in minds if there is a connection between this interest and biology in addition to the attitude toward the biology course. In this research, the following questions were tried to be answered:

1. Is there any significant difference in students' attitude towards biology and biology course in terms of gender?
2. Is there any significant difference in students' attitude towards biology and biology course in terms of their grade level?
3. Is there any significant difference in students' attitude towards biology and biology course in terms of pet-keeping variable?

It was based on the idea that studies can be carried out to provide more effective learning by developing students' attitudes in a positive way if there is a relation between these factors and the attitudes towards biology and biology course.

Research Methodology

General Background

The research was conducted in the relational survey model. In the basis of the relational survey model, there is the determining of the presence and/or degree of mutual exchange between two or more variables (Karasar, 2009). In the research, it was examined whether gender, grade level and pet-keeping variables affect students' attitudes towards biology and biology course. The research was carried out during the second semester of the 2017/2018 academic year in Turkey.

Sample

Convenience sampling was used to determine the sample of the research. While determining the sample size in validity-reliability analysis, it is recommended to reach 10 times the number of items in the scale (Hair et al., 2006). The variable that includes the smallest subgroups in this research was grade level. In order to prevent errors arising from sample size in analysis, it was planned to reach 10 times the number of items of the scale used in the research, at each grade level. The scale used in the research included 23 items. Thus, it was aimed to reach a minimum of 920 (10x23x4) students in total for 4 grade level. Within the scope of the research to achieve sufficient sample size, 1200 students in a secondary school were reached. However, 1047 of the research instruments applied to these students returned to be used in the analysis. The research was carried out in accordance with the volunteerism of the participants. The participants were informed about the scope of the study. It was stated that they have the right to leave the study at any time. Personality rights and private information of the participants were protected.

The ages of participants changed between 14 and 20, their age average was 16. 609 female and 438 male students have participated in the research. 28% (296 students) of the ones taking part in the research have said that they keep a pet at home whereas 72% (751 students) of the participants have stated that they do not have a pet. The distribution of the students according to their grade levels (9th, 10th, 11th and 12th) was respectively 242, 289, 260 and 256 students. 29% (177 students) of the female students keep a pet while 27% of the male students (119 students) do the same. The demographic information related to the sample is presented in Table 1.

Table 1

The frequency of the sample's demographic qualities (N (%))

Demographic Variable		Keeps a pet	Has no pet		Total
			Wants to have a pet	Doesn't want to have a pet	
Gender	Female	177 (29)	290 (47)	142 (23)	609
	Male	119 (27)	182 (41)	137 (31)	438
Grade level	9	75 (31)	124 (51)	43 (18)	242
	10	70 (24)	133 (46)	86 (30)	289
	11	82 (31)	112 (43)	66 (25)	260
	12	69 (27)	103 (40)	84 (33)	256

Instrument and Procedures

"Secondary School Students' Attitudes towards Biology and Biology Course Scale" improved by Atik et al (2015) has been used in the research while collecting data. In instrument prepared by the researchers, there is the scale made up of 23 items in addition to the introduction part encompassing the demographic information of the sample. The scale exposes a three-dimensional structure covering the Attitude towards Biology (9 items), the Attitude towards Biology course (8 items) and Concerns over Biology Course (6 items). The 5-point Likert-type scale ranged from "strongly disagree (1)," to "strongly agree (5)".

Reliability means the consistency between the answers given to the items by the individuals in the scale. Reliability co-efficient is usually expected to be .70 and above for psychological tests (Büyüköztürk, 2006; DeVellis, 2012). In order to determine a scale's reliability, there are several methods used, but in the study Cronbach's alpha has been calculated that fits for purpose. It is a method frequently used in the psychological tests that have three or more options (Büyüköztürk, 2006). After the reliability test results have been analyzed, it is ascertained that Cronbach's alpha reliability ratio calculated for the scale has been .94. On the other hand, the reliability ratios calculated for the scale's dimensions are respectively .91, .91 and .86.

Construct validity stands for the ability of a used test to measure an abstract concept in the right way (Büyüköztürk, 2006). For the purpose of controlling the appropriateness of "Secondary School Students' Attitudes towards Biology and Biology Course Scale" improved by Atik et al (2015) for the study's sample, the construct validity of this scale has also been examined and exploratory factor analysis has been made. In the process, the reliability of the data has been verified via Kaiser-Meyer-Olkin (KMO) sampling adequacy and Bartlett's Test of Sphericity. The data adequacy for factor analysis has been determined through considering the fact that Kaiser-Meyer-Olkin (KMO) value is more than .60 and Bartlett test makes sense (Tabachnick & Fidell, 2007). In the defining of the number of factors, factors whose eigenvalues are bigger than 1 are categorized as meaningful. Besides, the importance has been hugely given to the information associated with the fact that the common variance value must be 25 and more in addition to the fact that item factor loading point must be .40 and more while deciding if an item is going to take place in the scale. Factor analysis has given the same results with the analyses Atik et al. (2015) have conducted during the time of developing the scale. The analysis has also been supported for the sample which was to deal with the three-dimensional

structure of the scale. The 23 items in the scale were compiled in three dimensions including the attitudes towards biology, the pleasure they take in biology course and their concerns over biology course as mentioned by Atik et al. (2015) before. The factor loading changes between the values of .47 and .82.

Data Analysis

The data has been analyzed via being entered into SPSS 23.0 statistical program. Whether the attitudes developed by the students towards biology and biology course, if their concerns are interconnected with the factors such as gender, grade level or pet-keeping and based on the mutual effect of the factors, if they differ significantly were scrutinized through the use of Multivariate Analysis of Variance (MANOVA). It is a technique analyzing if groups vary in terms of more than 1 dependent variable. Additionally, one of the purposes has been if these factors have an effect together on the dependent variables with the analysis of multiple independent variables simultaneously.

Before the analysis, it has been examined if the data meets the MANOVA assumptions. In order to ensure MANOVA's multivariate normality assumption, the participants with a high level of Mahalanobis Distance Value have not been evaluated. Mahalanobis Distance Value is 16.27 for 3 dependent variables (Pallant, 2007). Consequently, the participant number has dropped from 1047 to 1036 before conducting the analysis, and the research has been done through the help of 1036 partakers. In this research, Kolmogorov-Smirnov tests and the analysis of the data diagrammatically show dependent variables have deviated from the normal distribution and homogeneity of variance-covariance matrix has failed. For multivariable analyses, it is regarded that it will not cause many problems if the equality or normality of variance is violated in the cases of having more than 30 participants in every cell (Pallant, 2007; Tabachnick & Fidell, 2007). From this point on, MANOVA has been applied by avoiding the assumptions of the equality and homogeneity of variance-covariance matrix. In MANOVA, there are a lot of multivariate tests in order to compare average scores of groups. Tabachnick and Fidell (2007) have reported that Pillai's Trace test is more powerful when contrasting the average scores of groups at the times of violation of assumptions in MANOVA. That is why, Pillai's Trace test has been helpful in the interpretation of the results in this research. That Pillai's Trace test gives meaningful results means that there are some differences among the groups in terms of dependent variables. Furthermore, since the assumptions are violated, chances of type 1 error increase, which is why instead of the traditional alpha value (α=.05), another alpha value (α=.0125) has been made use of as the statistical significance value (Stevens, 2009; Tabachnick & Fidell, 2007). After the MANOVA findings that are considered as statistically significant, the significance values in the table of Test of Between Subject Effect, calculated with MANOVA again, are scrutinized to define which dependent variables have the differences in-between. In order not to get type 1 error and to interpret properly, it is advised that Bonferroni correction must be applied through dividing alpha significance value to the number of dependent variables (Pallant, 2007). Since there are three dependent variables in this research, the alpha value was calculated as .017 (.05/3) via Bonferroni correction and this result has been paid attention to during the comparisons.

Multiple comparison (Post-hoc) analyses were used to specify between which independent variables having more than two groups there are differences in terms of dependent variables. There are many other post-hoc tests available to be used in different situations. In the research, Scheffe test which is one of the most common tests and is known to be a more meticulous method used for preventing type 1 error was applied (Pallant, 2007).

While interpreting clarification ratios of the differences coming up in dependent variables by the independent variables, eta squared value standards set up by Cohen (1988) were taken

into consideration. Cohen (1988) clarified the values up to .01 as low, the ones between .01 and .06 as middle and the ones of 14 and above as high eta squared values.

Research Results

Whether students' attitudes towards biology and biology course show significant differences in three dimensions connected to the common effect of the factors which include gender, grade level and pet-keeping or not was analyzed with the help of Multivariate Analysis of Variance (MANOVA). The first outcomes related to MANOVA are presented in the Table 2.

Table 2
The MANOVA results according to gender, grade level and pet-keeping variables

Source	Pillai's Trace	F	Hypothesis df	Error df	p	η^2
Gender	.054	19.296	3	1021	.0001*	.054
Grade level	.045	5.251	9	3069	.0001*	.015
Pet-keeping	.065	11.442	6	2044	.0001*	.032
Gender*Grade level	.028	3.258	9	3069	.001*	.009
Gender* Pet-keeping	.002	.264	6	2022	.954	.001
Grade level* Pet-keeping	.015	.837	18	3036	.657	.005
Gender*Grade level*Pet-keeping	.026	1.492	18	3036	.083	.009

*$p<.0001$

As seen in the Table 2, according to MANOVA results, it was stated that the points students got from the "Attitudes towards Biology and Biology Course Scale", gender and pet-keeping (Pillai's Trace=.002; $F_{(6-2022)}$=.264, $p>.017$), grade level and pet-keeping (Pillai's Trace=.015; $F_{(18-3036)}$=.837, $p>.017$), gender, grade level and pet-keeping (Pillai's Trace=.026; $F_{(18-3036)}$=1.492, $p>.017$) do not show statistically significant differences in accordance with the variables' interactions ; but, only the interactions of gender and grade level variables are significant. Also, it was detected that when gender (Pillai's Trace=.054; $F_{(3-1021)}$=19.296, $p<.017$), grade level (Pillai's Trace=.045; $F_{(9-3069)}$=5.251, $p<.017$) and pet-keeping (Pillai's Trace=.065; $F_{(6-2044)}$=3.258, $p<.017$) factors are handled separately, the students' points related to three dimensions of the attitude scale show significant differences in terms of these factors. Tests of Between Subject Effect and mean scores were examined to determine between which dimensions of the scale and which sample groups there are the significant differences. Also, the Scheffe Test results were taken into consideration for grade level and pet-keeping variables which include more than two groups. Findings are presented under separate headings.

The Analysis of the Attitudes of Students towards Biology and Biology Course in terms of Gender

It has been found out that female and male students also show significant differences in three dimensions of the scale when tests of between subject effect were examined ($p<.017$). In other words, there was a significant difference between the attitudes of students to biology (A1), their attitudes towards biology course (A2) and their concerns over biology course (A3)

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in terms of gender. The clarification percentages of these factors with the independent variable gender are 2.2%; 5% and 3.5% respectively. Cohen (1988) stated that these eta squared (η^2) ratios are average values (Table 3).

Table 3
The Interaction between A1, A2 and A3 points of female and male students

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	p*	η^2
	A1	18.752	1	18.752	22.590	.0001	.022
Groups	A2	38.195	1	38.195	52.782	.0001	.050
	A3	24.099	1	24.099	36.458	.0001	.035

*According to Bonferroni correction considered significance level is $p<.017$ (.05/3).

Upon looking at the average scores, it was deducted that the female students ($\bar{X}_{A1}$=3.27, $\bar{X}_{A2}$=3.56, $\bar{X}_{A3}$=3.78) are more affirmative in the scale's three dimensions than the males ($\bar{X}_{A1}$=2.98, $\bar{X}_{A2}$=3.14, $\bar{X}_{A3}$=3.45). This situation signs out to the fact that the female students are more affirmative towards biology and biology course in addition to their having less concern about biology course.

*The Analysis of the Attitudes of Students towards Biology and Biology
Course in terms of Grade Level*

When tests of between subject effect were examined, it has been detected that in three dimensions of the scale, students from different grade levels also show significant differences ($p<.017$). In other words, there is a significant distinction between the attitudes of students to biology (A1), their attitudes towards biology course (A2) and their concerns over biology course (A3) in terms of grade levels. The clarification percentages of these factors with the independent variable grade level were 1.7%; 4.3% and 1.4% respectively. According to Cohen (1988), these eta squared ($\eta2$) ratios were medium values (Table 4).

Table 4
The Interaction between A1, A2 and A3 points of the students from various grade levels

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	p*	η^2
	A1	14.692	3	4.897	5.900	.001	.017
Groups	A2	32.941	3	10.980	15.174	.0001	.043
	A3	9.296	3	3.099	4.688	.003	.014

*According to Bonferroni correction considered significance level is $p<.017$ (.05/3).

So as to define the significant differences between A1, A2 and A3 points among students from particular grade levels, the Scheffe Test was used:

It has been identified in terms of students' A1 (the attitude towards the biology) points, there are significant differences among the 9-10 and 11-12 grades ($p_{1,2}<.0001$). The average

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scores calculated for the A1 dimension for the 9th, 10th, 11th and 12th grades are respectively 3.36, 3.04, 3.09 and 3.01. It has been asserted that there is a significant difference ($p_{1,2,3}<.0001$) among 9th -10th, 9th -11th and 9th -12th grades in terms of A2 points (the attitude towards biology course). It is also observed that there is no significant distinction among other grade levels while the attitudes of 9th grade students differ significantly from other students of other grade levels statistically. For 9th, 10th, 11th and 12th grades, the calculated average scores in terms of A2 dimension are 3.70, 3.24, 3.29 and 3.16 respectively. In the sense of A3 points (concerns over biology course), only among 9th and 12th grades there are some significant differences along with the fact that the more the grade gets, the less A3 points become. The calculated average scores for this dimension were respectively 3.78, 3.59, 3.63 and 3.47 for the 9th, 10th, 11th and 12th grades. The drop of points for this dimension in which there are 5 negative, 1 affirmative item and where the negative items are encoded oppositely indicates that worries gradually increase.

The Analysis of the Attitudes of Students towards Biology and Biology Course in terms of the Mutual Effects of Both Gender and Grade Level Factors

When Tests of between Subject Effect were analyzed, it has been deducted that gender and grade level factors together have a significant difference ($p<.017$) on the dependent variables which are the attitudes towards biology (A1) and the attitudes towards biology course (A2) whereas they do not have a significant effect on the concerns over biology course (A3). The percentages and mutual effects of gender and grade level factors of the attitudes of students towards biology and biology course were 1.4% and 2.2% respectively. Cohen (1988) stated that these eta squared (η^2) ratios are average values (Table 5).

Table 5

The Interaction between A1, A2 and A3 points related to the common effect of gender and grade level factors

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	p*	η²
	A1	12.225	3	4.075	4.909	.002	.014
Groups	A2	16.734	3	5.578	7.708	.0001	.022
	A3	6.248	3	2.083	3.150	.024	.009

*According to Bonferroni correction considered significance level is $p<.017$ (.05/3).

When the attitudes of students towards biology (A1) and biology course (A2) were analyzed by considering the variables gender and grade level, it was seen that as the grade level increased, the attitude scores tended to drop. Additionally, it was detected that the attitude scores of female students at each grade level were higher than male students.

The Analysis of the Attitudes of Students towards Biology and Biology Course in terms of Pet-keeping Factor

It was deducted that the students keeping a pet, willing to keep a pet and not willing to keep a pet at home show some significant differences ($p<.017$) in the three dimensions of the scale separately after the analysis of Tests of between Subject Effect. That is to say, in terms of pet-keeping factor, there was a significant distinction among the factors related to the attitudes towards biology (A1) and biology course (A2) along with students' concerns over biology course (A3). The clarification percentages of these factors by pet-keeping factor were 5.6%;

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4.6% and 2.7% respectively. These eta squared (η^2) rates were thought to be mid ranges by Cohen (1988) (Table 6).

Table 6
The Interaction of A1, A2 and A3 points in terms of pet-keeping

Source	Dependent Variable	Sum of Squares	df	Mean Square	F	p*	η^2
	A1	49.518	2	24.759	29.826	.0001	.056
Groups	A2	35.391	2	17.695	24.454	.0001	.046
	A3	18.626	2	9.313	14.089	.0001	.027

*According to Bonferroni correction considered significance level is $p<.017$ (.05/3).

So as to define among which groups of pet-keeping factor the significant differences between A1, A2 and A3 points appear, the Scheffe Test was used:

The results indicated statistically significant differences in terms of A1 (the attitude towards biology) points between the students keeping a pet-the ones wanting to keep a pet, the ones keeping a pet-the others not wanting to keep a pet, the ones wanting to keep a pet-the others refusing to keep a pet ($p_{1,2,3}<.0001$). The average scores calculated for the A1 dimension are 3.46, 3.06 and 2.86 respectively for the students with a pet, the students wanting a pet and students not wanting a pet.

In the sense of A2 (the attitude towards the biology course), it was detected that students with a pet- students wanting a pet ($p<.0001$), students with a pet- students not enthusiastic for pet-keeping ($p<.0001$), students wanting a pet- students not enthusiastic for pet-keeping ($p<.01$) differ from each other significantly. The average scores calculated for the A2 dimension for the students keeping a pet, wanting a pet and not willing to keep a pet were 3.64, 3.24 and 3.17 respectively.

In terms of A3 (the concerns over biology course) points, the conclusion has been made that students with a pet- students wanting a pet ($p<.0001$) and students with a pet- students not enthusiastic for keeping a pet ($p<.0001$) show a significant distinction whereas students wanting a pet- students not enthusiastic for keeping a pet ($p>.05$) has no significant difference. The average scores calculated for the A3 dimension for the students keeping a pet, wanting a pet and not willing to keep a pet were respectively 3.83, 3.53 and 3.50.

Another finding of the research was the answers given to the question what kind of a pet students keep/ they want to keep. Among the answers given to the question what kind of a pet they keep, the bird (119 students; 40.5%) took the first place, the fish (64 students; 22%) came as the second choice, the cat (45 students; 15.3%) followed as the third option, the dog (32 students 11%) became the fourth choice, the rabbit (7 students; 2.4%) as the fifth and the hamster (5 students; 1.7%) lined up as the sixth option. Among the answers given to the question what kind of a pet they want to keep, the cat (200 students; 42.8%) took up the first place while it was being followed by the dog (124 students; 26.5%), the bird (39 students; 8.3%), the rabbit (20 students; 4.3%), the fish (15 students; 3.2%) and the hamster (6 students; 1.3%).

Discussion

At the end of the research, it has been ascertained that the students keeping a pet develop more affirmative attitudes towards biology and biology course (for the three dimensions of the scale) and the hypothesis "is followed by the students wanting to keep a pet and the ones not willing to keep one. In this case, the comment which states that students must be encouraged to keep a pet and love for animals must be instilled in them so that their attitudes towards biology

course will be more affirmative can be made. Prokop, Prokop, and Tunnicliffe (2007) stated that primary school students are fond of living organisms such as animals, but their positive attitude changes toward human-related issues and more abstract topics of biology during the secondary school. At this point, keeping students' interest in animals alive can be effective in maintaining their attitudes towards biology course in a positive way.

As stated also in the literature, biology is one of the courses in which pupils mostly have hardships and fail (Chuang & Cheng, 2003; Durmaz, 2004; Yeşilyurt & Gül, 2009a). However, knowledge about biology is highly substantial in that pupils can have a chance to comprehend themselves and their surroundings in this way. At this point, it is of huge importance to turn students' attitudes towards biology course into more affirmative manners since research state that the positive attitude towards the course makes learning easy and contributes to school success (Erten, 2008; Pehlivan, 1994; Yeşilyurt & Gül, 2009b). For this reason, it is thought if the positive attitude towards the course is promoted, the interest in the course and the will to study for the course will enhance as well as the school success.

That the female students' attitude points are higher is reached at the end of the research. This finding shows resemblance with many other research (Dawson, 2000; Ekici & Hevedanlı, 2010; Kışoğlu, 2018; Prokop et al., 2007). Moreover, when the fact that female students keep a pet at their homes more than males is taken into consideration, the mutual effect of gender and the habit of pet-keeping factors come to the mind. Yet, the findings put forward the fact that gender and pet-keeping factors do not have a significant effect together on an attitude. In this case, it can be said that gender and pet-keeping factors have independent effects on the attitude. The difference rising from gender factor is thought to be caused by the fact that the biology course is generally more appealing to the female students. Thus, Prokop, Prokop, and Tunnicliffe (2007) determined that girls show more interest in biology than boys, and they consider biology more important and less difficult than boys. Uitto (2014) stated that there is no gender difference in students' self-efficacy in biology course, however, girls and boys are interested in different areas of biology (boys are less interested in environmental protection, human biology and health issues); also in career orientations, girls found biology more important than boys. However, there are studies in the literature that have different results. For example, Nasr and Soltani (2011) reported that girls had better achievements in biology than boys, but there was no significant difference between girls and boys in terms of attitude towards biology.

That 9th grade students adopt more affirmative attitudes in the three dimensions of the scale when compared with other grade students has been detected. Though there are not significant differences among all grade levels, it is found out that generally in the three dimensions, there is a decrease from 9th to 12th grade and the gap between 9th and 12th grades seems to have grown statistically when the average scores are evaluated. In this case, the students who have just transmitted from primary schools to secondary schools appear to be more enthusiastic about biology and biology course, in addition to their being, less anxious about the courses. Another finding drawing attention is that the mutual effect of gender and grade level factors have significant effects upon the attitude dimensions related to biology and biology course. Along with the fact that female students adopt more affirmative attitudes towards biology and biology course than males, both genders' attitude points drop off as the grade rises. As the grade goes up, the concerns over the university entrance exam increase simultaneously. This situation is considered to be affecting the interest and attitude towards courses such as biology negatively, which give hard times to students, and their success rates are low in.

Conclusions

The results of the research indicated that students keeping a pet have more affirmative attitudes towards biology and biology course and have less concern for biology course. It is thought that taking care of a pet may have given students a different perspective on biology. The subjects such as physiological, anatomical features, evolutionary backgrounds, feeding ways, disease situations, cleaning, maintenance, and even education of some of the animals are among the subjects of biology that are examples from daily life. It is thought that the positive attitudes of students keeping a pet are probably due to their interest in these issues. In this case, biology teachers who give examples on pets at relevant points during the lesson can increase the students' interest in the lesson.

The incentive of students to recognize the animals around them and the enlightenment of them about those animals' qualities greatly affect their attitudes towards biology and biology course. That is why, it is recommended within the framework of the curriculum to provide guidance on this issue, to include activity suggestions for increasing students' interest in animals, and to develop relevant teaching materials. That students are closely acquainted with animals, they are encouraged to rear a pet, their attentions are drawn through relating subjects with pets that can at least be brought into class atmosphere, or trips are organized to animal houses, zoos, museums through which their attentions and interests in animals can be supported will all be beneficial.

As a result of the research, it was found out that the attitude scores of female students towards biology and biology course were higher than the male students, and their concern was less. Regulating the content of biology curriculum to draw more attention of male students can influence male students' attitudes in a positive way. Teaching courses through relating subjects with daily life and organizing more activities in the class that students are more actively involved in could be helpful in that they feel supported in the reduction of concerns in addition to their developing positive attitudes towards biology and biology course. Since family support is of huge importance in terms of not only reducing students' exam anxieties, but pet-keeping, recognizing animals and loving them, it is considered that raising awareness in families about these topics could also be useful.

Another result of the research is that as the grade level increases, there is a decrease in attitude points towards biology and biology course and an increase in concern towards biology. It seems that the teaching process in secondary education has a negative impact on students' perspectives on biology and biology course. It is thought that this situation is to be largely due to university entrance exam concern. In addition, increasing the details of many biology subjects in secondary school (which have been at primary education level processed relatively more superficially and learned with pleasure) and the increase in the amount of knowledge that may require memorization may also affect students' attitudes. At this point, it is thought that this disadvantage can be prevented by making biology course more enjoyable, giving examples from daily life and current issues, and supporting meaningful learning instead of memorizing knowledge as much as possible with different teaching techniques and approaches.

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