

## Views of Prospective Chemistry and Biology Teachers on National and International Environmental Problems (The Case of Atatürk University)

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**Abstract:** This study aims to examine levels of awareness about and sensitivity towards environmental problems among prospective chemistry and biology teachers, their suggestions for the solving of problems, and views on activities that can be used for environmental education. In addition, the study aims to examine whether levels of social and academic awareness among prospective teachers vary significantly by gender and by the grade they are attending. The sample of the study consisted of a total of 312 prospective teachers in their first, second, third, fourth and fifth year of university education, attending the Chemistry and Biology Teaching Departments of Atatürk University's Kazım Karabekir Faculty of Education in the autumn semester of the 2009-2010 academic year. A survey questionnaire was used as the data collection instrument for the study. The first section of the questionnaire contained items on demographics, the second section contained items on the views of the prospective teachers on environmental problems and environmental education, and the third and fourth sections contained 5-point Likert type items on levels of social and academic awareness among the prospective teachers. Cronbach's Alpha reliability coefficient of the questionnaire was found to be 0.81. Frequencies and percentages, independent samples t-test, and One-Way ANOVA were used for data analysis. Results of the analyses conducted show that according to prospective teachers, overuse of natural resources is the most important environmental problem in the world, educators are the most effective group for the solution of environmental problems, environmental organizations are the most effective in creating environmental awareness, and environmental education should start in the pre-school period. Levels of social and academic awareness among prospective teachers did not vary significantly by gender, levels of social awareness significantly varied by the grade attended, and levels of academic awareness did not vary significantly by the grade attended.

**Key words:** *Environment; Ecology; Environmental education*

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### Introduction

Environment is the physical, biological, social, economic and cultural environment where people and other living beings maintain their relationships and interact throughout their lifetime. In other words, environment represents the setting or conditions where a living being is present. Therefore living beings have a healthy life only in the presence of a healthy environment. The disruption of the environment that is a system of relations and emergence of the environmental problems started with the disturbance of the natural balances mainly because of man influence. Human life is based on various balances. Missing links in the chain of natural balance established by people with the environment affect the entire chain, disturb this balance and cause environmental problems (Atasoy, 2005).

Environmental problems increase more and more and threatens all living beings, particularly people and the natural balance. It is argued that the environmental problems of the world will come to

an uncontrollable state in the near future unless serious measures are taken starting from the present time.

Imbalanced use of natural resources brought the nature itself and living beings to the point of depletion. If we look at the history of nature, all of the extinct species were destroyed due to the changes in the natural environment. Gradual disruption of the natural balance may even bring the extinction of human race onto the agenda. Therefore, each individual should fulfil his/her share of responsibility in order to find solution to environmental problems without losing time. Environmental problems of today are not problems that can be solved only with technology or the laws. This is possible only through changing individual behaviours. Changing individual behaviours require the change of attitude, knowledge and values. Creating positive attitude and values towards the environment is possible through environmental education. Environmental education give ecology information on one hand, and it helps individuals to improve their attitude towards environment and converts such attitudes into behaviours on the other hand. Environmental

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education appeals to cognitive, emotional and psycho-motor areas of students.

Particularly teachers and all other education professionals have a big responsibility in this matter.

### Objective of the Study

This study aims to examine levels of awareness about and sensitivity towards environmental problems among prospective chemistry and biology teachers, their suggestions for the solving of problems, and views on activities that can be used for environmental education.

### Problem Sentence

What are the views and how is the level of sensitivity of prospective biology and chemistry teachers about the environmental problems and environmental education?

### Sub Problems

Answers were sought to the following problems in the context the aforementioned main problem sentence.

1. What are the views a of prospective biology and chemistry teachers about the environmental problems and environmental education?

2. How is the level of social and academic sensitivity of prospective biology and chemistry teachers about the environmental problems and environmental education?

3. Does the level of social sensitivity of prospective biology and chemistry teachers about the environmental problems and environmental education vary based on their genders and grades they are attending?

4. Does the level of academic sensitivity of prospective biology and chemistry teachers about the environmental problems and environmental education vary based on their genders and grades they are attending?

### Constraints of the Study

This study is limited with

1. Academic year of 2009-2010,

2. 312 prospective biology and chemistry teachers studying at first, second, third, fourth and fifth grades in the Department of Biology and Chemistry Education of Kazim Karabekir Faculty of Education at Ataturk University.

3. The measurement tool used in the study.

### Method

Study model, population and sample group, data collection techniques and analysis of the data are presented in this section.

### Study Model

In the present study, descriptive statistical methods were used to determine the views of prospective biology and chemistry teachers about global and national environmental problems and their social and academic sensitivity against such problems. Descriptive studies are aimed at describing the interaction between conditions in consideration of the relationship of the current events with the past events and conditions. Observation and test techniques are widely used in descriptive studies in addition to questionnaires and interviews. Questionnaire technique was used for collecting the sample group data (Ibis, 2008).

### Population and Sample Group

Population of this study consists of prospective biology and chemistry teachers studying in the Biology and Chemistry Teaching Program in the Faculties of Education in Turkey, and the sample group consists of prospective biology and chemistry teachers studying at Biology and Chemistry Teaching Departments of Kazim Karabekir Faculty of Education at Ataturk University during the fall term of the academic year 2009-2010. Table 1 shows the percentage and frequency distributions of the prospective biology and chemistry teachers based on their genders and grades they are attending.

**Table 1:** Percentage and Frequency Distribution of the Sample Group Based on Gender and Grades

Gender	Female		Male		Total	
	f	%	f	%	f	%
Class						
1st Grade	69	76.6	21	23.3	90	28.8
2nd Grade	30	62.5	18	37.5	48	15.3
3rd Grade	25	52.1	23	47.9	48	15.3
4th Grade	20	35.7	36	64.2	56	17.9
5th Grade	37	52.8	33	47.1	70	22.4
TOTAL	181	58.1	131	41.9	312	100

As it can be seen in Table 1, 58% of the prospective biology and chemistry teachers are females and 41.9% of them are males.

### Data Collection Tools

The questionnaire applied to the prospective biology and chemistry teachers has been developed by Karadayi (2005). However, some changes were made before applying the questionnaire. A pilot application was carried out for assessing the reliability of the questionnaire and as a result, one question was removed from the questionnaire.

Pilot study results were assessed based on statistical operations and reliability coefficient-Cronbach Alpha value of the questionnaire was found 0.83. Accordingly, it is possible to say that the questionnaire used in the study is highly reliable (Kalayci, et al., 2005).

### Data Analysis

Data collected in the study were analysed using SPSS/PC (Statistical Package for Social Sciences for Personal Computers) software. 1st part of the questionnaire is related with the personal information and at this stage, information on gender and grade are represented as frequency and percentage. Question in the 2nd part are aimed at determining the views of prospective teachers on environmental problems and environmental education and their frequency and percentage values were calculated. Questions in the 3rd part and 4th part are questions in 5-point Likert Scale. 9 questions in the 3rd part were prepared to measure social sensitivity of prospective teachers. Maximum score that can be achieved in this part for social sensitivity is 45 and the minimum score is 9. Based on this score system, score range of 9-20 represents low level of social sensitivity, score range of 21-32 represents mid-level social sensitivity and score range of 33-45 represents high level of social sensitivity. 8 questions in the 4th part of the questionnaire were prepared to measure the academic sensitivity of the prospective teachers.

Maximum score that can be achieved in this part for academic sensitivity is 40 and the minimum score is 8. Based on this score system, score range of 8-18 represents low level of academic sensitivity, score range of 19-29 represents mid-level academic sensitivity and score range of 30-40 represents high level of social sensitivity.

### Findings and Comments

In this part, the findings obtained as a result of the study are presented in tables and comments are made.

#### 1. Findings Related with the First Sub Problem

Findings obtained from 8 questions asked in Part II of the questionnaire aimed at the Sub Problem "What are the views of prospective biology and chemistry teachers about the environmental problems and environmental education?" are represented as percentage and frequency.

1. Answers given to the question "In your opinion, what is the most important environmental problem in the world?" asked to the prospective biology and chemistry teachers with the purpose of determining the most important environmental problem are shown in Table 2 and the results are interpreted.

**Table 2:** Frequency and Percentage Distributions of the Views on the Most Important Environmental Problems in the World

"In your opinion, what is the most important environmental problem?"	f	%
1. Excessive use of the natural resources	130	41.6
2. Air pollution	30	9.6
3. Climate change	43	13.8
4. Radioactive pollution	22	7.05
5. Population increase	11	3.5
6. Water pollution	21	6.7
7. Energy problem	46	14.7
8. Urbanization	9	2.8
9. Other()	0	0
TOTAL	312	100

Based on the data shown in Table 2, 41.6% of the prospective biology and chemistry teachers who participated in the study think that the most important environmental problem in the world is the "use of natural resources". 14.7% of the prospective teachers think "energy problem" is the second most important environmental problem. 13.8% of them think "climate change" is the third most important environmental problem.

2. Views of the prospective teachers on "the most important environmental problems in Turkey" are shown in Table 3 as frequency and percentage distributions and the results are interpreted.

Based on the data shown in Table 3, 41.6% of the prospective biology and chemistry teachers who

participated in the study think that the most important environmental problem in Turkey is the "climate change". 41.3% of the students who represent a percentage close to the first group think "excessive use of the natural resources" is the second most important environmental problem. "Energy Problem" is the third with 17.0%.

3. Views of the prospective biology teachers on "the most effective group for the solution of the environmental problems" are shown in Table 4 as frequency and percentage distributions and the results are interpreted.

**Table 3:** Frequency and Percentage Distributions of the Views on the Most Important Environmental Problems in Turkey

"In your opinion, what is the most important environmental problem in Turkey?"	f	%
1. Excessive use of the natural resources	129	41.3
2. Water pollution	30	9.6
3. Energy problem	53	17
4. Air pollution	36	11.5
5. Depletion of forests	21	6.7
6. Radioactive pollution	7	2.2
7. Climate change	130	41.6
8. Other	6	2
TOTAL	312	100

**Table 4:** Frequency and Percentage Distributions of the Views on the Most Effective Group for the Solution of the Environmental Problems

"Which one of the following is the most effective group for the solution of the environmental problems?"	f	%
1. Educators	148	47.4
2. Environmental organizations	62	19.8
3. Statesmen	49	15.7
4. Administrators	42	13.4
5. Students	5	1.6
6. Other (Society, I don't know, all people, media)	6	1.9
TOTAL	312	100

Table 4 shows that 47.4% of the prospective biology and chemistry teachers who participated in the study see "educators" as the most effective group for the solution of the problems, 19.8% of them see "environmental organizations" and 15.7 % see "statesmen" as the second and third most effective groups, respectively. 1.6% of them see "students" as the least effective group. These results show that the prospective biology and

chemistry teachers place more trust on the educators for the solution of the environmental problems.

4. Views of the prospective biology teachers on "the tools that would contribute the most in raising the environmental awareness of people" are shown in Table 5 as frequency and percentage distributions and the results are interpreted.

**Table 5:** Frequency and Percentage Distributions of the Views on Tools That Would Contribute the Most in Raising the Environmental Awareness of People

"In your opinion which one of the following contribute the most in raising the environmental awareness of people?"	f	%
1- Environmental organizations	131	42
2- Schools	65	20.8
3- TV and radios	78	25
4- Newspapers and magazines	19	6.08
5- Municipalities	13	4.1
6-Other (All)	6	1.9
TOTAL	312	100

Data provided in Table 5 shows that 42% of the prospective biology and chemistry teachers who participated in the study consider "environmental organizations" as the biggest contributors in raising the environmental awareness of people. 25.0% of them see "TV and radios" as the second and 20.8% of them see "schools" as the third most important tools that would contribute in raising the environmental awareness of people. However, it is thought-provoking to see that the prospective biology and chemistry teachers considering educators as the most important factor in solution of the problems, however, they see schools less effective than TV and radios when it comes to raising the environment awareness.

5. Views of the prospective teachers on "economic development and ecological balance" are shown in Table 6 as frequency and percentage distributions and the results are interpreted.

Based on the data shown in Table 6, majority of the prospective biology and chemistry teachers who participated in the study and correspond to 75% agree with the view that "balance should be established between the economic sanctions and technological-economic development to create a liveable world model". In addition, 18.2% agree with the view that "economic and technological development should be limited in order to protect the environment and natural balance". Based on these findings, it would not be wrong to say that the majority of the prospective biology and chemistry

teachers agree on the requirement of technological and economic developments, however it may be

beneficial to control such developments through ecological sanctions.

**Table 6:** Frequency and Percentage Distributions of the Views of the Prospective Teachers on Economic Development and Ecological Balance

"Which one of the following is the closest to your view?"	f	%
1- Balance should be established between the economic sanctions and technological-economic development to create a liveable world model.	234	75
2- Economic and technological development should be limited in order to protect the environment and natural balance.	57	18.2
3- Economic development should continue without slowing down even if it is for the expense of disrupting the environment or disturbing the ecological balance.	21	6.7
TOTAL	312	100

6. Views of the prospective teachers on "the objective of teaching environmental matters" are

shown in Table 7 as frequency and percentage distributions and the results are interpreted.

**Table 7:** Frequency and Percentage Distributions of the Views of the Prospective Teachers on the Objective of Teaching Environmental Matters

"In your opinion, which one of the following is the objective of teaching environmental matters?"	f	%
1- Encouraging students towards being active in protecting the environment	157	50.3
2- Showing students that the knowledge they attain at school is related with the daily life	64	20.5
3- Helping students in understanding the current problems	35	11.2
4- Environmental matters raise interest and awake the attention of students	20	6.4
5- It is something they should know	23	7.3
6- It is a good method for teaching problem solving and decision making skills	10	3.2
7- Other	3	0.96
TOTAL	312	100

Based on the data shown in Table 7, 50.3% of the prospective biology and chemistry teachers who participated in the study see "encouraging students towards being active in protecting the environment" as the most important objective of teaching the environmental matters, 20.5% of them see "showing students that the knowledge they attain at school is related with the daily life" as the second most important objective and 11.2% see "helping students in understanding the current

problems" as the third most important objective. Only a small group of 3.2% think that "it is a good method for teaching problem solving and decision making skills"

7. Views of the prospective teachers on "which period environmental education should start" are shown in Table 8 as frequency and percentage distributions and the results are interpreted.

**Table 8:** Frequency and Percentage Distribution of the Views of the Prospective Teachers on Which Period Environmental Education Should Start

"In your opinion, in which period environmental education start?"	f	%
1- Pre-school	252	80.7
2- Elementary school	45	14.4
3- Secondary school	5	1.6
4- Common-public education	8	2.5
5- Higher education	2	0.6
TOTAL	312	100

Data provided in Table 8 shows that 80.7% of the prospective biology and chemistry teachers who participated in the study think that environmental education should start "during the pre-school period". 14.4% think that environmental education should start during "elementary school" period. 0.6% of them forming a very small group think that it should start "during higher education period". Common opinion of more than half of the

prospective biology and chemistry teachers on starting the environmental education during pre-school period underlined the sensitivity they show towards environmental education.

8. Views of the prospective teachers on "the methods used in environmental education" are shown in Table 9 as frequency and percentage distributions and the results are interpreted.

**Table 9:** Frequency and Percentage Distributions of the Views of the Prospective Biology Teachers on the Methods Used in Environmental Education

"When you start teaching, which one of the following methods would you prefer to use for giving environmental education in your classes?"	f	%
1- Discussions on books, articles, TV and radio programs with environment-related headlines	154	49.3
2- Field trips	63	20.1
3- Individual or group research projects	52	16.6
4- Civil movement activities	23	7.3
5- Other (Planting seedlings, all)	2	0.6
6- Activities based on hand skills	18	5.7
TOTAL	312	100

Data provided in Table 9 shows that 49.3% of the prospective biology and chemistry teachers who participated in the study prefer "discussions on books, articles, TV and radio programs with environment-related headlines" with the purpose of giving environmental education when they start teaching, 20.1% said they could use "field trips" and 16.6% stated that they could use "individual or group research projects".

## 2. Findings Related with the Second Sub Problem

**Table 10:** Analysis Results on Social and Academic Sensitivity of the Prospective Biology and Chemistry Teachers

Dimensions	N	Minimum	Maximum	X	S
Social sensitivity	312	9	45	28.10	4.61
Academic sensitivity	312	8	40	36.21	3.19

Maximum score that can be obtained by the prospective teachers in Part II of the questionnaire prepared for measuring their social sensitivity levels is 45 and the minimum score is 9. Based on this score system, score range of 9-20 represents low level of social sensitivity, score range of 21-32 represents mid-level social sensitivity and score range of 33-45 represents high level of social sensitivity. Based on the results provided in Table 10, mean social sensitivity level of the prospective biology and chemistry teachers was found (X)=28.10. If we analyse based on the aforementioned score system, mean social sensitivity level is within the score range of 21-32 and this shows that the social sensitivity levels of the prospective teachers is at mid-level.

Maximum score that can be obtained in the part of the questionnaire prepared for measuring the academic sensitivity level is 40 and the minimum score is 8. Based on this score system, score range of 8-18 represents low level of academic sensitivity, score range of 19-29 represents mid-level academic

How is the level of social and academic sensitivity of prospective biology and chemistry teachers about the environmental problems and environmental education? 9 questions asked in the Part III of the questionnaire on the aforementioned sub problem describes the social sensitivity of prospective teachers and 8 questions asked in Part IV describe their academic sensitivity. 8 questions asked in this part describe the academic sensitivities. The findings are shown in Table 10.

sensitivity and score range of 30-40 represents high level of social sensitivity. Based on the results provided in Table 10, mean academic sensitivity level of the prospective biology and chemistry teachers was found (X)=36.21. If we analyse based on the aforementioned score system, mean academic sensitivity level is within the score range of 30-40 and this shows that the academic sensitivity levels of the prospective teachers is at high-level.

**2.1. 4.** Does the level of social and academic sensitivity of prospective biology and chemistry teachers about the environmental problems and environmental education vary based on their genders and grades they are attending?

t-test was applied to independent groups with the purpose of analysing whether the level of social and academic sensitivity of the prospective biology and chemistry teachers vary based on the gender and the results are provided in Table 11.

**Table 11:** T-test results analysing whether the level of social and academic sensitivity of the prospective biology and chemistry teachers vary based on the gender

Gender	N	X	S	Sd	t	p
				(Df)		
Female	181	28.32	4.42	310	1.12	0.287
Male	131	27.32	5.21			

t-test results of the independent groups provided in Table 11 show that there is no significant difference between the genders and social sensitivity of the prospective biology and

chemistry teachers on environmental problems and environmental education as the significance level of the p value is higher than 0.05 ( $p=0.287$ ;  $p > 0.05$ ). "Single-Factor Variance Analysis for Independent

Sample Groups (One-Way Anova" was used with the purpose of analysing whether social sensitivity levels of the prospective biology and chemistry teachers vary based on the grades they attend.

Results of the one-way anova are provided in Table 12.

**Table 12:** Results of One-Way Anova Analysing Whether Social Sensitivity Levels of the Prospective Biology and Chemistry Teachers Vary Based on the Grades They Attend

Variance Source	Sum of Squares	sd (Df)	Mean-Square	f	p	Significant Variance
Between Groups	292.19	4	73.05	9.26	0.00	Grade 1-2
						Grade 1-4
						Grade 2-4
						Grade 3-4
Within the groups	2420.85	307	7.89			Grade 4-5
Total	2713.05	311				

Based on the results of the single-factor variance analysis for independent sample groups shown in Table 12, there is no significant variance in the social sensitivity levels of the prospective biology and chemistry teachers based on the grades they attend as the p value is lower than the significance level of 0.05 ( $p=0,00$ ;  $p < 0,05$ ).

"Single-Factor Variance Analysis for Independent Sample Groups (One-Way Anova" was

used with the purpose of analysing whether academic sensitivity levels of the prospective biology and chemistry teachers vary based on the grades they attend. Table 13 shows the results of the one-way anova showing the variance of the academic sensitivity of the prospective teachers based on the grades they attend.

**Table 13:** Results of One-Way Anova Analysing Whether Academic Sensitivity Levels of the Prospective Biology and Chemistry Teachers Vary Based on the Grades They Attend

Source of variance	Squares	sd	Squares	f	p	Significant Variance
Source	Total	(Df)	Average			
Between Groups	38.87	4	9.72			
Within the groups	987.96	307	3.22	3.019	0.279	-
Total	1026.84	311				

Based on the results of the single-factor variance analysis for independent sample groups shown in Table 13, there is no significant variance in the academic sensitivity levels of the prospective biology and chemistry teachers based on the grades they attend as the p value is lower than the significance level of 0.05 ( $p=0,279$ ;  $p > 0,05$ ).

## Results

1- Prospective teachers gave the answer "excessive use of natural resources" in connection with the most important environmental problem in the world and they gave the answer "climate change" in connection with the most important environmental problem in Turkey with a very small variance. The present study supports the results provided in the study of Akbas (2007), Ibis (2008) and Hansen (2005).

2- Prospective biology and chemistry teachers think that the most effective group in solving the environmental problems is educators.

3- Prospective biology and chemistry teachers think that environmental organizations provide the

highest level of contribution in raising the environmental awareness of people. The present study supports the results provided in the study of Dastan (1999) and Ibis (2008).

4- The fact that the prospective biology and chemistry teachers chose for the requirement of creating a liveable world model by establishing the balance between economic sanctions and technological-economic development in connection with the balance between the economic development and ecological balance indicates the positive correlation between the technology and environment.

5- In connection with teaching the environmental matters, it was observed that the prospective teachers favour the idea of encouraging students towards being active in environmental matters.

6- For the question "In your opinion, in which period of education should environmental education start?" , prospective teachers gave the answer pre-school period thus it showed that they embrace the mentality "as the twig is bent so is the tree inclined". In his study, Eaten (2005) argued

that the interests and attitudes attained during the pre-school education period lay foundations of the terminal behaviours in the future. The present study supports the results provided in the study of Eaton (2005).

7- Prospective teachers in the sample group stated that they would choose the method of discussing books, articles, TV and radio programs for giving environmental education in their classes when they start teaching.

8- It was found that the academic sensitivity of the prospective teachers is at higher level when compared with the social sensitivity. Kavruk (2002) argues that the sensitivity level of the individuals towards environmental problems increase in proportion with the level of education. The present study supports the findings of Kavruk (2002) and Ibis (2008).

### Recommendations

1. Beyond any doubt, education is one of the most important factors in creating the environmental sensitivity. The increased importance attached to the environmental education will also increase the environmental awareness. Environmental education should start during the pre-school education period.

2. Environmental educations should be improved continuously during elementary, secondary and higher education periods, students should be encouraged towards maximum level of participation in the projects developed.

3. Particularly, environmental sensitivity awareness should be instilled at higher levels to the students at faculties of educations when compared with other graduate level students.

4. Environmental problems continue to change and they do not decrease but increase. Therefore, efforts in connection with the environmental problems should be renewed on continuous basis.

5. Mass communication tools such as TVs, radios should prepare programs that would attract the attention of people on the environmental problems more.

6. Naturally, one of the most important factors in raising the environmental sensitivity is the attitude of parents. Because education starts within the family.

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