

EVALUATION OF THE UNIVERSITY STUDENTS' OPINIONS ON ENVIRONMENTAL AWARENESS USING DATA MINING ASSOCIATION RULE

Ilkay YELMEN¹, Nahide TOSYALIOGLU²

¹Istanbul Aydın University, Faculty of Engineering & Architecture, Department of Software
Engineering, Istanbul, Turkey

²Gazi University, Graduate School of Educational Science, Chemistry Education
Ankara, Turkey

E-mail: ilkayyelman@stu.aydin.edu.tr, nahide.tosyalioğlu@gazi.edu.tr

Abstract- *Environment is an indispensable surrounding atmosphere for the living things to survive. However, there has begun to emerge some problems in parallel with the increase in the number of living things on earth. Especially, when the harm people give to the environment is taken into consideration, it is seen that people aren't given adequate training on environment. If the damage to the environment isn't prevented, it is inevitable to expect major dangers. Environment conscious individuals should be educated from childhood. But since people tend to change their ideas over time, education on environment should be set in a specific structure. In this work, the survey carried out with the candidate teachers about the effect of environmental awareness on those who instruct and their views on environmental education is evaluated.*

Keywords: *Environmental awareness, environmental education, data mining, association rule*

1. INTRODUCTION

Environment, in general, is defined as the surrounding for living things. Ecologically, it is a term that covers everything related to the individual either alive or dead [1].

Natural environment is the environment where natural activities and natural forces are formed and where human effect isn't seen. People are constantly in interaction with nature. Throughout their lives, by developing technology and doing various economical activities, they have constituted an unnatural environment [2].

The main reason for the emergence of environmental problems is human. To overcome these problems, people must be taught the responsibilities incumbent upon them. Achieving this will only be possible with an effective environmental education [3].

The Constitution of 1982, 56th article stipulates that "Everyone has the right to live in a healthy and balanced environment, and improving the environment, preserving it and preventing the environmental pollution are the duties of every citizen and the state." According to this article in the Constitution, people's living in a healthy and a proper environment depends upon their fulfilling their responsibilities. The most effective way to make people gain environmental awareness is to increase and generalize environmental education. Environmental education should cover all the society to increase the sensitivity of people about

the environment and gain permanent changes in their behaviors. The main objective of environmental education is to contribute to the people who have completed their education to be equipped with incentive knowledge and skills on being sensitive to the environmental issues [4].

Primary and secondary education institutions are responsible for providing training on environmental issues. But on the other hand, basic content and courses related to the environment are not available in higher education. When the faculties of education are examined, it is seen that only a few number of branches teach the environmental issues. These departments are Science Education, Social Studies Education, Primary School Education, Biology Education and Geography Education departments. Courses include no more than Environmental Science, Environmental Issues, Environmental Education, and Contemporary World Issues. It can be said that the situation is not enough to create environmental awareness over students [5].

So far a lot of studies have been done on environmental awareness and environmental education, and these studies were analyzed in different methods and dimension. Girls are found to be more sensitive than boys according to some sources, but some others reported that it did not change according to gender and that environmental awareness is not in the desired level. Studies have shown that, the sensitivity to the environment vary in different age groups but not too much [5,6]. In

addition, it has been stated that the most important factor in creating environmental awareness is environmental education [7,8], and that the education on environment should be extended [9]. Women are seen to be more interested in the training given on environment and the training is also stated to be useful [10]. In all educational levels from pre-school to university, according to variables such as students' gender and age, changes in their attitude and behavior were investigated [11]. In increasing the sensitivity to the environment, especially primary school students' project-based educational system has been observed to be more effective [5,12].

Computer-based education system is becoming more common in environmental education. Providing training to people in a virtual environment promotes learning. Furthermore, mobile devices offer a variety in environmental education. The electronic notes provide students with important opportunities in learning. Mobile devices are quite useful because they are easily portable. In particular, environmental education and eco-tourism projects can easily be used [13].

In another study, it has been found out that students contribute to environmental sensitivity by sharing the photos they have taken and sending these photos via messages. In this study, men are found to be more sensitive than women. Besides these, environmental awareness has been reported to vary according to age and their average marks [14].

2. DATA MINING

Data mining is a field of computer science and statistics that has been developed for exploration and analysis of large quantities of data to discover meaningful patterns and rules. Data mining includes various techniques including decision tree, statistics, neural networks, genetic algorithm and visualization techniques.

2.1. Association Rule

In data mining association rule learning is a popular and well researched method for discovering interesting relations between variables in large databases. Piatetsky-Shapiro defines analyzing and presenting strong rules discovered in databases using different measures of interestingness [16]. Based on the concept of strong rules, introduced association rules for discovering regularities between products in large-scale transaction data recorded by point-of-sale (POS) systems in supermarket. For example the rule {onions,potatoes} => {burger} found in the sales data of a supermarket would indicate that if a customer buys onions and potatoes together, he or she is likely to also buy hamburger meat. Following the original definition by Agrawal et al.

The problem of association rule meaning is defined as: $I = \{i_1, i_2, \dots, i_n\}$ Let be a set of n binary attributes called items. Let $D = \{t_1, t_2, \dots, t_m\}$ be a set of transactions called the database [17].

2.2. Apriori Algorithm

Witten I. H. et al said "Apriori algorithm meet minimum support and confidence for generating association rules. Apriori follows a generate-and-test methodology for finding frequent item sets and generating successively longer candidate item sets. Each different size of candidate item set requires a scan through the dataset to determine whether its frequency exceeds the minimum support threshold. Although some improvements to the algorithm have been suggested to reduce the number of scans of the dataset, the combinational nature of this generation process can prove costly and particularly" [18].

3. WAIKATO ENVIRONMENT FOR KNOWLEDGE ANALYSIS (WEKA)

Weka, developed by the University of Waikato containing machine learning algorithms, is an open source data mining program [19]. WEKA contains a variety of data pre-processing, classification, regression, clustering, association rules, and visualization tools. Algorithms can be applied directly to dataset or it can be called from java code [20]. We can see some menus about weka in figure 1. Explorer menu is the most widely used menu in weka. It enables to perform some processes step by step in visual environment. When you open the Explorer menu, open the screen shown in Figure 2. The data can be imported to weka as arf, csv and C4.5 formats and also attribute selection and filtering can be done on this screen. Simple CLI menu provides run to command mode and knowledge flow provides to achieve the project using drag and drop method.



Figure 1: Weka start-up screen

4. METHOD

4.1. Data Sources

In this study, students studying in the spring semester of the 2010-2011 academic year in Samsun Ondokuz Mayıs University in the Faculty of Education (234 female, 130 male) with a total of 364 were randomly chosen. The number of students according to their gender is presented in Table I.

Variable	Level	N	%
Gender	Female	234	64.29
	Male	130	35.71
	Total	364	100.0

Table I : The sample distribution by gender

4.2. Data Collection

In the study, a questionnaire consisting of 39 questions and 2 sections were used. First section is Personal Information Form. Second section is Awareness on The Environment Scales. The second part was divided into 5 categories [21]. These sections are:

1. Opinions about environmental issues
2. Environmental awareness
3. Sensitivity to the environment
4. Precautions to be taken on environmental issues
5. Authorities' efforts on environmental challenges;

In the students' personal information form, there are questions which aim to determine the independent variables related to him and his family.

1. Gender
2. Departments
3. The region they came from
4. Number of siblings

4.3 Data Evaluation

In this study, data on the results of the survey were used in excel. The data is then converted to csv format and then according to the data mining association rule they are evaluated with Weka 3.6 software. Apriori algorithm is used in evaluation and analysis has been done by trying different combinations of attributes. Minimum support is used as 0.1 in analysis part. Different values are tried on confidence and some rules are revealed shown in Figure 3.

EVALUATION OF THE UNIVERSITY STUDENTS' OPINIONS ON ENVIRONMENTAL AWARENESS
 USING DATA MINING ASSOCIATION RULE
 Ilkay YELMEN, Nahide TOSYALIOGLU

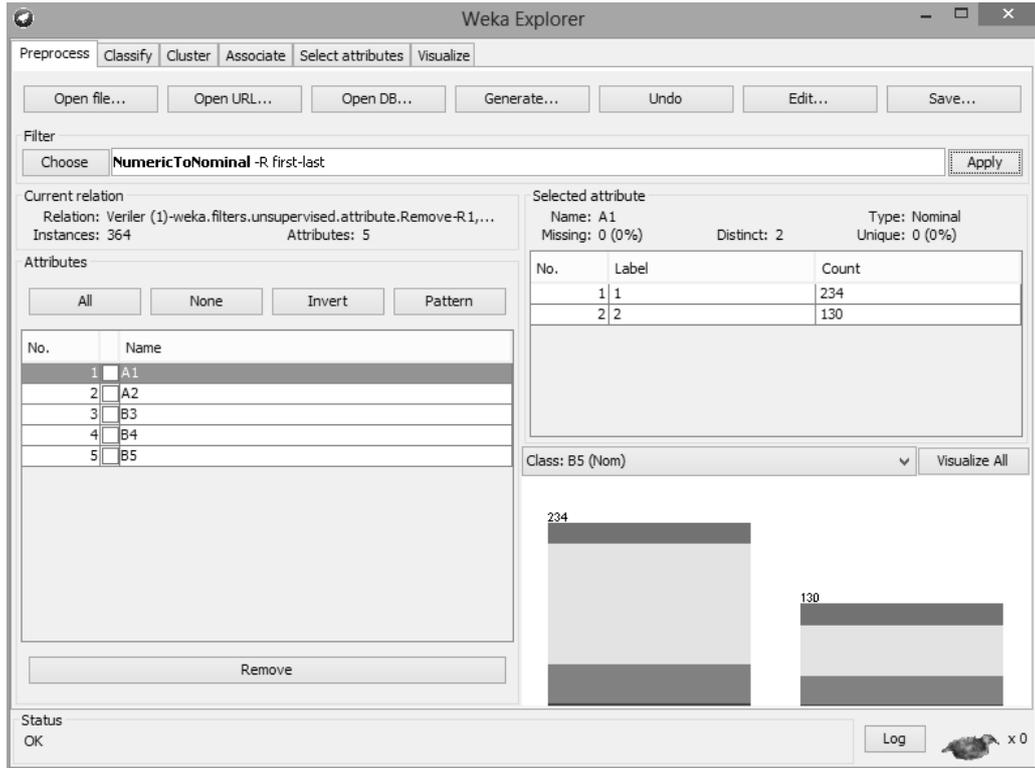


Figure 2: Training Set Sample

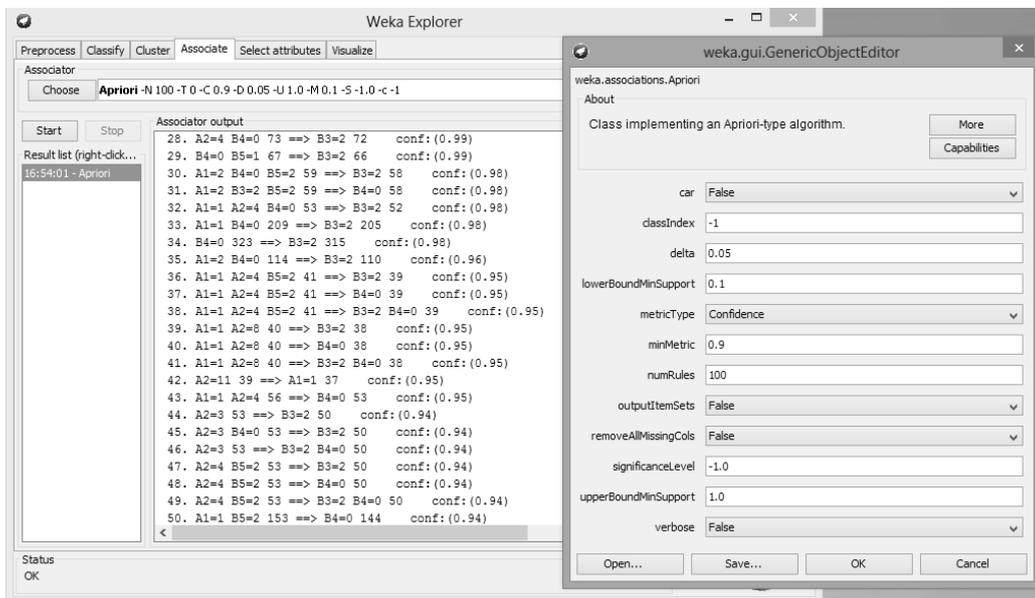


Figure 3: Association rule results

4.4. Findings

	Level	F	%	Variable	Level	F	%	
Gender	Female	234	64.29	Regions	Black Sea	223	61.26	
	Male	130	37.71		Marmara	47	12.91	
	TOTAL	364	100.0		Aegean	11	3.02	
Departments	Social Studies	7	7.2		Mediterranean	18	4.94	
	Science	18	11.0		Southeastern Anatolia	12	3.29	
	Elementary Education	53	9.7		Central Anatolia	44	12.08	
	Turkish Education	78	14.4		Eastern Anatolia	9	2.50	
	Chemistry	41	7.4		Total	364	100.0	
	Mathematics	68	12.4		Number of Siblings	Blank	1	0.27
	Educational Science	14	11.7			None	14	3.84
	Computer Edu.	41	7.4	1-2		186	51.10	
	Preschool Ed.	39	7.0	3-4		115	31.60	
	Others	5	0.9	5-6		34	9.34	
Total	364	100.0	7	14		3.85		
				Total		364	100.0	

Table II: Teacher candidates' personal information

According to table II; it is found that;

The majority of the sample was composed of female students to become teachers, Participation among departments is mostly from Turkish education, There are many students who come from the Black Sea Region to the university. Most of them have two siblings.

In the evaluation done according to the association rule ,the results are as follows:

60% of those who come from smaller towns and who know the causes of environmental pollution and who care to throw away their rubbish into dustbins warn the ones who pollute the environment.

60% of the women coming from cities know the causes of environmental pollution and cares to throw their wastes into dustbins.

Men from the Black Sea region, although they are not a member of an environmental non-governmental organization throw their waste into the trash.

90% of men coming from provinces are not a member of any civil society organizations.

46% of the women who have been trained related to the environment got an average grade between 4 - 3.5.

Although the rate of those who pay attention to throw their rubbish into rubbish boxes and who think this will contribute to the economy is % 85,they are not a member of a non-governmental organization.

The rate of those who think it's not given enough attention to the environment by the visual and written media and who think environmental education should begin in pre-school is 86% .

91% of those who know the causes of environmental pollution and throw their waste into the trash want their wastes to be collected separately.

78% of female students find the efforts of the authorities on environmental awareness insufficient.

72% of the female students collect electronic waste and batteries and send them to the factories to be recycled.

91% of male students who pay attention to planting seedlings is not a member of a non-governmental organization.

89% of the female students who cannot take environment-related training and who take pains to planting is not a member of a non-governmental organization.

78% of those who know the reasons of environmental pollution without receiving any training and who pay attention to the quality of fuel used in the houses or in vehicles is female.

EVALUATION OF THE UNIVERSITY STUDENTS' OPINIONS ON ENVIRONMENTAL AWARENESS
USING DATA MINING ASSOCIATION RULE
Ilkay YELMEN, Nahide TOSYALIOGLU

72% of female students is partly paying attention to the quality of fuel used in the home or in vehicles.

93% of female students studying at the Department of Mathematics is thinking that environmental education should begin in pre-school.

78% of female students who has taken environmental training says that family is more important in gaining environmental awareness.

71% of people interested in environmental issues say the environment pollution caused by solid waste is more than the others.

5. CONCLUSION

According to the data analysis over 364 data, it has been found out that there is a meaningful structure on the views of the university students in terms of environmental awareness. It has been identified that female students are more sensitive to the environment than male students. It has been proved that students' attitudes towards the environment doesn't depend on their cities, number of siblings, their classes, level of education, the school they graduated and their families according to the program they are attending students were found not to have different views about the environment.

In the analysis study done due to data mining association rule, students are found to be highly sensitive to the environment despite not being a member of a non-governmental organization. From this, it can be inferred that non-governmental organizations working on environment are not so important in gaining environmental awareness

People who lived in cities or towns before coming to university can be said to have almost the same sensitivity towards the environment.

Most of the people think that environmental awareness should be taught before pre-school that is, it should be given by the family. Here it is understood that the education given by the families to gain awareness of environment at a young age is much more effective.

Students have stated that, visual and printed media doesn't give enough importance on environment, adding that most university students haven't gained environmental awareness and that they do not find the works done both by the authorities and the universities on environmental awareness enough. From here, we can infer that the environment education is not enough but poor and therefore it doesn't meet the needs.

It can be said that there aren't any direct relationships between the average grade points of the students and their sensitivity to environmental problems.

It has been found that students can differentiate between waste and recycling and most of them want the wastes to be collected separately. Besides these, from the results of the data, we can say that

most students think waste can contribute to them economically.

Especially female students were found to give more attention to recycling. Many of them contribute to the recycling of waste batteries and electronic waste.

Male students give more importance on planting trees and most of them do this without being a member of any civil organisations.

The environment-conscious students say that pollution caused by solid waste is much more than others.

6. DISCUSSIONS

On the same subject, research has been conducted of 575 students and data was evaluated using SPSS 12 program. As a result of the research, the sensitivity of male students to the environment was seen to be higher. In addition, differences have been observed in terms of environmental awareness according to different departments. Especially students who study at pre-school department were found to be more sensitive than other students. In parallel with this, it has been concluded that environmental education should start at pre-school period [20].

According to the studies reviewed were not given proper training on environmental issues. Environmental education in Turkey has been given since 1991. But up to now in the process on a regular plan, not prepared in this regard. But shall be effected by experts in the field of a quality education. However, given by experts in the field of environmental education and the situation in this way, when the students have detailed information about the environment issues.

According to the results of this study, we can say that it should be given more importance on education in creating environmental awareness. In the study, female students' being more sensitive to the environment may be due to their delicate structure. Again, people think that visual and written media do not give enough importance on environmental awareness and so it can be said that not making people environment conscious could lead to major problems in the future. Awareness about the environment will be more effective in the visual media. Because the ads to be published in an effective manner, may be more persistent in people's minds. In terms of environmental awareness, the training given by especially pre-school education and families will contribute to the future and help to grow up environment conscious individuals at a very young age. But the training should not be limited just before school. It should be continued throughout peoples' lives in certain periods and in accordance with the individual. In addition, currently not very active civil societies should re-organize their activities exclusive to

EVALUATION OF THE UNIVERSITY STUDENTS' OPINIONS ON ENVIRONMENTAL AWARENESS
USING DATA MINING ASSOCIATION RULE
Ilkay YELMEN, Nahide TOSYALIOGLU

different age groups and do facilities as to improve environment conciousness.

7. REFERENCES

[1] Berkes F., Kışlalıoğlu M., *Ekoloji ve Çevre Bilimleri*, Türkiye Çevre Sorunları Vakfı Yayınları, Ankara, 1993.

[2] Ertan, B., "Türkiye'de Çevre Hakkının Gelişimi". *Ankara Üniversitesi Sosyal Bilimler Enstitüsü yayınlanmamış yüksek lisans tezi*, Ankara, 1991.

[3] M. Altın, H. Bacanlı, K. Yıldız, "Biyoloji Öğretmeni Adaylarının Çevreye Yönelik Tutumları", *V. Ulusal Fen Bilimleri ve Matematik Kongresi*, Ankara. 2002.

[4] Devlet Planlama Teşkilatı, *Çevre Eğitimi, İnsan Gücü ve Katılım Planlaması*, VII. Beş Yıllık Kalkınma Planı Özel İhtisas Komisyonu, Ankara, 1994.

[5] M. Alım, "Avrupa Birliği Eğitim Sürecinde Türkiye'de Çevre Ve İlköğretimde Çevre Eğitimi", *Kastamonu Eğitim Dergisi*, vol:14 (2), pp.599-616, 2006.

[6] R. Şeker, D. Çınar, A. Özkaya, "Çevresel Faktörlerin Üniversite Öğrencilerinin Başarı Düzeyine Etkileri", *İnönü Üniversitesi 13. Ulusal Eğitim Bilimleri Kurultayı*, 2004.

[7] A. Meydan, S. Doğu, "İlköğretim 2. Kademe Öğrencilerinin Çevre Sorunları Hakkındaki Görüşlerinin Bazı Değişkenlere Göre Değişmesi", *Selçuk Üniversitesi Ahmet Keleşoğlu Eğitim Fakültesi Dergisi*, vol:36, pp.267-277, 2008.

[8] N. Uzun, N. Sağlam, "O.Ö. Kurumlarında Çevre Eğitimi ve Öğretmenlerin Çevre Eğitim Programlarındaki Görüşleri", *14. Ulusal Eğitim Bilimleri Kongresi*, Denizli, 2005.

[9] ODTÜ Çevre Topluluğu, "Üniversitelerde Çevre ve Çevrecilik Algısı Anketi", *12. Çevre Sorunlarına Öğrenci Yaklaşımları Sempozyumu*, Erzurum, 2009.

[10] H. Tor, "Increasing women's environmental awareness through education", *Procedia Social and Behavioral Sciences* vol:1, pp.939-942, 2009.

[11] Marmara Üniversitesi, "Yeşil Konumlandırma Anketi", Anket No:118, 2005

[12] A. Yılmaz, İ. Morgil, P. Aktuğ, İ. Göbekli, "O.Ö. ve Üniversite Öğrencilerinin Çevre, Çevre Kavramları ve Çevre Sorunları Konusundaki

Bilgileri ve Öneriler", *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi*, vol:22 (23), pp.156-162, 2002.

[13] M. Ruchter, B. Klar, W. Geiger, "Comparing the effects of mobile computers and traditional approaches in enviromental education", *Computers & Education*, vol:54, pp.1054-1067, 2010.

[14] H. Uzunboylu, N. Çavuş, E. Erçağ, "Using mobile learning to increase enviromental awareness", *Computers & Education*, vol:5, pp.381-389 2009.

[15] U. Fayyad, G. Piatetsky – Shapiro, P. Smith, "The KDD process for extracting useful knowledge from volumes of data", *Communication of the ACM* pp.39,27-35, 1996.

[16] Piatetsky – Shapiro, Gregory G., *Discovery, analysis and presentation of strong rules in Piatetsky – Shapiro, Gregory; and Frawley, Williams J.; eds., Knowledge Discovery in Databases*, AAA/MIT Press, Cambridge, MA, 1991.

[17] R. Agrawal, T. Imielinski, A. Swami, "Mining Association Rules Between Sets of Items In Large Databases", *SIGMOID Conference*, pp.207-216, 1993.

[18] Witten I. H., Frank E., Hall M. A., *Data Mining Practical Machine Learning Tools and Techniques* 3.rd edition Elseiver, USA, pp:216, 2011.

[19] D. Patterson, F. Liu, D. Turner, A. Concepcion, R. Lynch, "Performance Comparison of the Data Reduction System", *Proceedings of the SPIE Symposium on Defense and Security*, Orlando, 2008.

[20] H. Karaer, F. Karaer, N. Tosyalıoğlu, Z. Çelik, "Öğretmen Adaylarının Çevre Bilincine Yönelik Görüşlerinin Bazı Değişkenler Açısından Belirlenmesi (Samsun Örneği)", *X. Ulusal Ekoloji ve Çevre Kongresi*, 2011