

The Effect of an Authentic Learning Environment on Creating Conceptual Awareness in Environmental Education, Shaping Value Judgments and Increasing Participation Levels

Abstract

In today's world of rapidly increasing environmental concerns, traditional environmental education provides the level of knowledge that will meet teaching targets but is ineffective in achieving the highest goals in this context. Effective environmental education should facilitate the highest level of attitude development in individuals, helping them to form value judgments and attain participatory skills. In this study, a program of authentic learning-based teaching was designed to be used in the teaching of today's environmental issues and an attempt was made to determine the effectiveness of such teaching. The research data were collected by posing 10 open-ended questions to 168 pre-service teachers before and after the teaching program. The data were subjected to qualitative and quantitative analysis. The results showed that teaching by making use of the authentic learning-based technique of panel discussion was markedly effective in achieving the higher level skills of forming value judgments and increasing initiative-oriented participatory skills focused on the environment.

Keywords: *environmental education, authentic learning, Balıkesir-Kazdağ gold exploration and processing*

Introduction

Society needs to be made aware of environmental problems and environmental consciousness is made possible through achieving and fostering behavioral change in individuals (Gayford, 1996; Kuhlemeier, Berg & Lagerweij, 1999). To increase the effectiveness of environment-related class studies, teaching approaches must encourage the active participation of students, save students from the unnecessary burden of superfluous knowledge, and facilitate the development of their intellectual capacities (Şahin, Cerrah, Saka & Şahin, 2004). Social interaction, the people around us, and culture is of significant importance in making knowledge meaningful. In this context, interaction among teachers, students, persons and organizations involved in a particular topic facilitates and speeds up the learning process, making permanent retention possible. If teachers can make use of the time in the learning environment in which this interaction is possible, more effective teaching will take place and students will thus be given the opportunity to formulate and construct the knowledge in their minds, using it for more efficacious mental processes (Vygotsky, 1998; ICPD, 1999). There are four striking elements in the fundamental philosophy of the constructivist theory of learning: learning about the real world through life-contexts, learning by doing, learning through projects, and learning through problem-solving. These also constitute the starting points and fundamental philosophy of approaches to learning (Knoblock, 2003). Authentic learning refers to learning with materials not specifically developed for learning, and is based on a constructivist teaching model that seeks to ensure learning by transferring situations and complexities found in real life into the classroom environment (Cholewinski, 2009). The goal in authentic learning is to produce solutions for real-life problems rather than to directly deliver knowledge on a particular topic. Because events and solutions in authentic tasks are connected with the real world, they are not limited to the learning atmosphere that is set up in the classroom or to the knowledge that is only of interest to the individuals in the classroom. These learning situations concern not only those inside the classroom but also everyone outside the boundaries of the classroom walls. Those who share life problems must participate in the learning process (Bektaş & Horzum, 2010). The element of authentic context in authentic learning is that problems exist in the real world, that they elicit different points of view that must all be respected, and that each problem is uniquely complex. Authentic activities must consist of real-life problems and students should take active part in identifying these. Expert performance refers to applying to experts to obtain knowledge and enlisting their help to create a context. Multiple perspectives ensure that students consider a

topic from different perspectives rather than accepting a single point of view. Collaboration creates an environment of cooperation that helps students to gain skills and question phenomena, enabling them to share knowledge among themselves, and learn different perspectives concerning the task at hand. Reflection provides an opportunity to determine what and how students have learned in the process, giving them a chance to speak about what they have learned. Authentic assessment, however, involves alternative assessments outside of traditional evaluation methods. It is based on measuring performance in situations that are similar to tasks in the real world (Herrington, Reeves, Oliver, & Woo, 2004). In authentic learning, the student is assigned the role of openly manifesting collaboration and reflection. The role of the teacher is to make sure that the student is provided with different perspectives in the face of problems. Besides applying different methodology and techniques, another need of environmental education is to find the right program and subject content. The results of the United Nations Conference on Environment and Development, held in 1992, led to defining four levels of targets for developing environmental education programs. These are: I. Ecological Foundations; II. Conceptual Awareness; III. Review and Assessment; and IV. Environment-focused Entrepreneurship (Hungerford, & Peyton, 1994). The purpose of this study was to design, implement and determine the effects of an authentic learning-based teaching program for pre-service teachers that would increase conceptual awareness, enhance the review and assessment as well as participatory skills needed to generate solutions for a currently existing local environmental problem at the different target levels.

Method

The sample for the study consisted of 168 pre-service teachers at Balikesir University Necatibey School of Education, Science Teaching Department. The quantitative dimension of the study was based on real-life experimental research of random design and used a pre-test, post-test and a control group; details are shown in Table 1.

Table 1. Academic status of the study and control groups

	Year	N			
Control Group	1st and 2nd years	100	Pre-test	No teaching program	Post-test
Study Group	3rd and 4th years	68	Pre-test	Authentic Teaching	Post-test

The Authentic Learning Environment

The subject of the gold exploration and mining carried out in the Kaz Mountains and Balıkesir and the effect of this on the environment was chosen as a subject in the environmental science class. This real-life world problem has attracted interest at many levels in Turkey and particularly in the region; it is a matter about which there is a great deal of information pollution. For this reason, panel discussions were organized to help students use the authentic learning environment to reach authentic scientific information and expertise as quickly as possible (Erciyeş, 2008). Geophysics, mining and metallurgy engineers, the municipality mayor, two physicians and two attorneys were invited to participate in the first panel. Participating in the second panel were the deputy manager of a corporation that extracted and processed gold in the region and two mining engineers, who were all prepared to assess the subject from different perspectives.

Data collection instrument and analysis

Ten open-ended questions were used as the data collection instrument (Table 2).

Table 2. Questions on the Pre – and Post-tests and their levels and targets.

Question	Level	Target
1. What do you know about gold exploration and mining techniques and methods?	II	Conceptual awareness
2. Write down all the chemicals you know that are used in gold mining.	II	Conceptual awareness
3. Write down what you know about how the waste products of these facilities can spread out into the environment.	II	Conceptual awareness
4. Write down what you know about the gold exploration and mining carried out in the Kaz Mountains.	II	Conceptual awareness
5. Write down what you know about the condition of the water, soil, air and plant life in the region during mining operations.	II	Conceptual awareness
6. Which do you think is more valuable--the top of the soil of the Kaz Mountains or what is underground?	III	Review and assessment
7. What kind of mining do you favor in terms of the country's development?	III	Review and assessment
8. Do you think gold exploration and mining is an ecological issue?	III	Review and assessment

Question	Level	Target
9. If gold exploration and mining is an ecological issue, what have you done as an individual regarding this problem?	IV	Environment-focused entrepreneurship
10. Would you like to participate in a trip to an abandoned or non-productive mine?	IV	Environment-focused entrepreneurship

The first dimension of the data collection instrument focused on the Level II target of conceptual awareness, the second on the Level III target of investigating and evaluation (questions 6, 7 and 8), and the third dimension was related to the Level IV target of environment-focused entrepreneurship (questions 9 and 10). The highest score that could be received in the first five knowledge-based questions was 50. The opinion of an expert was enlisted in terms of the content and language of the questions. The Level I target of ecological foundations was treated in class in a general discussion. The related and unrelated samples for the first dimension of the study and control group questionnaires were analyzed with a t test in the SPSS 17.0 program. The responses to the questions in the second dimension of the questionnaire were analyzed using the method of content analysis. The data were first coded by the researcher and themes were set up. Another faculty member was asked to repeat the reliability test part of the analysis. One of the questions in the third dimension of the questionnaire was analyzed using content analysis and the responses to the second question were calculated to find percentages.

Results

The first dimension of the questionnaire

The equivalence of the entry scores of the sample were compared with the students' pre-test mean scores unrelated samples t test. Accordingly, it was determined that the study and control groups were equivalent; these results are shown in Table 3. The effectiveness of the teaching shown in the comparison of the post-tests of the study and control groups is shown in Table 4.

Table 3. Comparison of Pre-test Mean Scores of Study and Control Groups

	N	Mean	S	sd	t	p
Study Group	100	9.54	5.56	166	1.32	.189
Control Group	68	8.30	6.44			

p>.05

Table 4. Comparison of the post-test mean scores of the students in the study and control groups

	N	Mean	S	t	sd	p
Study Group	100	29.14	8.96	10.74	166	.000
Control Group	68	14.81	7.73			

$p < .05$

In Table 4, the difference between achievement mean scores on the post-test was significant in favor of the study group. The post-test mean scores of the study group 3rd – and 4th-year students compared by means of the unrelated samples t test are shown in Table 5.

Table 5. Comparison of the post-test mean scores of the 3rd and 4th year students

	N	Mean	S	t	sd	p
3rd year	49	24.77	8.66	5.41	98	.000
4th year	51	33.33	7.08			

$p < 0.05$

According to Table 5, the difference between the mean scores of the 3rd – and 4th-year students displays significance in favor of the 4th-year students.

The second dimension of the questionnaire

The analysis of all the responses to the questions designed to determine the students' views was performed; two of the questions are presented here. What kind of mining do you support in terms of the country's development? The responses to this question in terms of percentages are presented in Table 6.

Table 6. Findings concerning the question "What kind of mining do you support in terms of the country's development?"

Year	Pre-test			Post-test		
	Environment-conscious f%	Processing in Turkey f%	I have no idea f%	Environment-conscious f%	Processing in Turkey f%	I have no idea f%
1	17.39	39.13	36.75	29.16	47.91	15.55
2	31.81	18.18	31.81	59.09	27.27	13.63
3	48.97	22.44	28.57	48.97	30.61	20.40
4	29.41	52.94	17.64	55.37	33.92	8.92

The responses to this question were distributed almost evenly on the pre-test. After the program of teaching, the 4th-year students stood out in their environmental awareness (55.37%), and their views on processing in Turkey (33.92%), while the “I have no idea” responses fell to 8.92%. Looking at the analysis of the question “Do you think gold mining is an ecological issue?” in Table 7, it can be seen that about 68% of the 1st – and 2nd-year students did not have an opinion but an average of 30% accepted this as an issue. After the program, the 3rd – and 4th-year students exhibited a change of 20% and 30% respectively, meaning that they accepted the matter as an issue in the percentages of 89% and 96.07% respectively.

Table 7. Findings concerning the question “Do you think that gold mining is an ecological issue?”

Year	Pre-test			Post-test		
	Yes f%	No f%	I have no idea f%	Yes f%	No f%	I have no idea f%
1	28.26	2.17	67.39	86.66	-	13.33
2	31.81	-	68.18	81.81	-	18.18
3	69.38	-	30.61	89.79	-	10.21
4	66.66	-	33.33	96.07	-	3.93

The third Dimension of the Questionnaire

The analysis of the question posed as, “If extracting gold from cyanide is an ecological issue, what have you done about this as an individual?” can be seen in Table 8.

Table 8. Findings concerning the question, “If extracting gold from cyanide is an ecological issue, what have you done about this as an individual?”

Year	Pre-test						
	I haven't done anything f%	Forestation f%	Actions f%	NGO membership f%	Trips f%	Participation in Seminars/Meetings/Conferences f%	Being Informed f%
1	82.60	2.17	2.17	4.34	2.17	-	6.52
2	68.18	9.09	4.54	-	-	4.54	13.63
3	65.3	2.04	6.12	4.08	4.08	6.12	12.24
4	70.58	3.9	9.8	1.96	-	1.96	11.76

Year	Post-test						
	I haven't done anything f%	Forestation f%	Actions f%	NGO membership f%	Trips f%	Participation in Seminars/Meetings/Conferences f%	Being Informed f%
1	73.91	2.17	4.34	4.34	2.17	-	13.04
2	63.63	9.09	9.09	-	-	4.54	13.63
3	53.06	2.04	10.20	4.08	4.08	6.12	20.40
4	25.49	3.92	17.64	1.96	1.96	41.17	25.49

In general, it was seen that about 75% of the students did nothing about this issue. While the percentage of the fourth-year students who had participated in seminars, meetings or conferences prior to the panels was 1.96%, the situation was different after the panels and 41.17% said that they had attended such events.

Results and Discussion

The groups were equal to each other in terms of preliminary knowledge before the teaching program. After the program, a significant difference was found between the study and the control groups in favor of the study group. These results show that in the teaching about the subject of gold exploration and mining in the Kaz Mountains, the technique of conducting an authentic learning-based panel was effective in reaching the Level II conceptual awareness target.

When the Level III target questions related to forming value judgments were examined, it was found at the end of the program that almost all of the 4th-year students said that the topsoil was important and that they valued both nature and the environment. These students supported the idea that mining should be carried out with methods that are not harmful to the environment, that underground resources should be mined by local investors and used to add value to the country's economy. After the teaching program, the number of the students who were in favor of mining provided the environment was respected had risen by approximately 25%. In the case of another question related to this goal, 66.66% of the 4th-year students before the panels and 96.07% after the panels stated their belief that gold exploration and mining was an ecological issue; the percentage of those that said they had no idea receded to 3.93%. It was seen that 30% of the students who had no value judgment on the topic had formed a judgment. As Rost et al. (2002) have reported, when environmental education is inadequate or fails to assist in forming

judgments and creating depth in knowledge and skills, applications such as the one in this study may be able to overcome this problem. The question in Level IV concerning enhancing participatory skills recorded a 50% increase at its highest level after the program. Participation was effected in different activities such as seminars, conferences, protests related to environmental issues, membership in civil organizations and field trips. There were also student responses that indicated that they had started to watch for news programs on the environment on the Internet, in newspapers, on television and in other media channels. With respect to participatory skills, as Geray (2002) has stated, environmental education is not only beneficial in terms of offering individuals the opportunity to claim their environmental citizenship rights and fulfill their environmental responsibility, it is also an exercise in democracy that stresses the importance of participation. In addition, the fact that the active participation of all social groups in the environmental habitat has an important place in the Local Agenda 21 project reinforces the importance of participation in environmental education. That it has been accepted that the ideal of sustainable development can be achieved not by imposition but by the actual participation of individuals and groups is evidence of the need for a participatory educational program that will take on this function.

The environmental education that is needed in the contemporary world must go beyond the boundaries of traditional environmental protection teachings and offer a new perspective that will ensure the establishment on the earth of sustainable living culture and focus on developing cognition, perception, skills and competencies toward this end (Özdemir, O., 2007). The method of discussion used in the study awakens an interest in students and develops their skills in assessing their own understanding, their comprehension of reality, and their critical thinking processes (Alicigüzel, 1979; Çepni, 2005). However, the stages of the implementation of these methods and techniques are very important. The post-tests of the 3rd – and 4th-year students in the study group exhibited a difference in favor of the 4th-year students in the comparison. In the other questions, the value judgments of the 4th-year students were higher, albeit not significantly higher, than those of the 3rd-year. It is thought that the reason for this difference was that during the panels, many of the 4th-year students had volunteered to be actively involved. Also, environmental education can only be effective if programs in and outside of school support and complement each other (Güler, 2009). The technique of panel discussions is one that achieves this interaction.

The practical use of the technique, however, presents various difficulties. Among these difficulties are getting the necessary official permissions, synchronizing the time of panelists and participators, finding a secure space, meeting the cost, etc. In

this study, the difficulties multiplied because of the two different basic perspectives opposing each other. Moreover, other aspects that need to be addressed are keeping the scientific method at the forefront, maintaining and reflecting total impartiality whatever the circumstances. The panel technique is also very beneficial when viewed from the perspective of what students can gain. Because subjects cannot be taught in detail within the limits of the traditional class hour and since it is not possible for a teacher to have the same amount of knowledge in different subjects, the panel technique presents an advantage, at the same time contributing greatly to in-service teachers' scientific and social development. With such an application, students discover that solving environmental problems is not easy, that they must listen patiently to different views on ecological issues, and they are given the skills to assess problems in all their dimensions, produce their own thoughts using their own mental abilities, and be participating individuals. It is for this reason that it is believed that using the method of authentic learning will significantly add to the effectiveness and quality of environmental education. This matter has attracted the interest of the printed and visual media and resulting publications have reached the general public. This has also become an activity that fulfills the universities' goals of creating public awareness. It is of particular importance that faculty members be supported by their universities in their efforts to organize such activities.

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