The Effects of Multiple Intelligences Instructional Strategy on the Environmental Awareness Knowledge and Environmental Attitude Levels of Elementary Students in Science Course

Gökhan BAŞ*

Abstract

The aim of the research was to investigate the effects of Multiple Intelligences strategy and traditional methods of instruction on elementary students' environmental awareness knowledge levels and their attitudes towards the environment. The pre/post-test control group research model was used in this study. The research was carried out in 2009 – 2010 education-instruction year in an elementary school in Nigde, Turkiye. Totally 60 students in two different classes in the 7th grade of this school participated in the study. The data obtained in the study were analysed by the computer programme SPSS 15.0. The arithmetic means and standard deviations were calculated for each group. In order to test the significance between the groups, the t-test was used. The significance level was taken as .05. The results of the research showed a significant difference between the environmental awareness knowledge levels and attitude scores of the experiment group and the control group. It was also found out that the multiple intelligences instructional strategy activities were more effective in the positive development of the students' attitudes and their environmental awareness knowledge levels. At the end of the research, it is revealed that the students who are educated by Multiple Intelligences instructional strategy have more environmental awareness knowledge levels and have a higher motivation level than the students who are educated by the traditional methods of instruction. It was also found out that the students participated in the experimental process which multiple intelligences strategy was applied enjoyed the activities, had great fun and they became more aware of the environmental issues.

Keywords: Environmental education, environmental awareness knowledge level, environmental attitude, multiple intelligences strategy, science and technology course

* Address for correspondence: Gokhan Bas, Selcuk Universitesi, Egitim Fakultesi, Egitim Bilimleri Bolumu, Meram, Konya, Turkey. Phone: +90 505 687 66 77. E-Mail: gokhanbas51@gmail.com

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Introduction

All of the factors that affect physical, biological, socio-psychological, social-economic and cultural lives of people can be defined as "the environment" (Özmen, Çetinkaya & Nehir, 2005; Şama, 2003). Broadly speaking, environment is defined as the sum total of all conditions and influences which affect the development and life of all organisms on earth (Kumar De & Kumar De, 2004).

The developments of the scientific and technological fields since the industry revolution have brought many problems with them. The developments in regard for the development of the quality of life have affected the ecosystem and led to the death of many living beings in the environment. It is the people who can say "stop" and solve these problems that threaten the environment. One of the most important responsibilities of the nations is to educate their people and to sustain "environmental education" at school so as to make them gain environmental awareness knowledge and positive attitudes towards the environment (Erol & Gezer, 2006; Palmer, 1998; Uzun & Sağlam, 2006). In this regard, it is assumed by some that increased knowledge about the environment promotes positive attitudes (Bradley, Waliczek & Zajicek, 1999).

There is a general concern about the increasing deterioration and exploitation of the natural environment (Bozkurt et al., 2005; Chacko, 1998). According to Erdoğan, Kostova and Marcinkowski (2009) and Sethusha (2006), it can be observed that most of the environmental degradation that occur today is the result of the failure of our society and educational systems to provide citizens with the basic understanding skills needed to make aware about the environment. In this sense, it can be said that it is very important to inform people about the environment and make them gain awareness and positive attitudes towards the environment since the education that will be given to people is considered to be crucial. For the success of this issue, it is essential to make students gain awareness about the environmental problems and positive attitudes towards the environment. This can only be sustained by formal education carried out at school (Ballantyne & Packer, 1996; Hungerford & Volk, 1990; Sethusha, 2006; Smyth, 2006; Uzun & Sağlam, 2006). An increased recognition of the importance of environmental education provides an important reason for developing students' understanding of the environment (Brown, 1997; Sethusha, 2006).

There are legal regulations in the world and it has been accepted that the protection of the environment is a citizenship duty. People should be educated and made aware about the environment itself in order to protect it and prevent the environmental problems. This can be sustained via formal environmental education by schools (Aslan, Sağır, & Cansaran,

2008). One of the main approaches in preventing the environmental problems is environmental education.

Environmental education aims to direct learners to explore and investigate their own surroundings or their environment (Sethusha, 2006). It is an important tool in assisting children to develop a greater understanding of their ever-changing world (Wilke, 1997). Through environmental education, it is expected that children will gain the knowledge, skills and values needed to make decisions and to take action, which will sustain rather that deplete the planet (Murdoch, 1993; Sethusha, 2006).

As Gambro and Switzky (1996) and Helden (1995) want to help children obtain more extensive knowledge and awareness of the environment, then they would be able to create teaching situations in which children's ideas and skills can be challenged and/or extended since some different occasions should be created for children to gain knowledge and awareness for the environment. As Boyes & Stanisstreet (1998) suggest, "environmental campaigns should be organised at schools for students to know more about the environment" (p.2). In this regard, research has clearly indicated that a well-trained and caring educator is the most critical element in a quality classroom (Baş, 2009; Isbell & Exelby, 2001; Phillips et al., 2000). Educators have to strive to provide children with many opportunities to expand their knowledge by actively participating in an environment that is appropriate for their level of development. A good learning environment empowers children to become confident learners (Sethusha, 2006; Stevenson, 2007). Apart from the children's level of knowledge and supporting the idea that environmental education has to be seen as a strategy in achieving environmental improvement, other studies point towards the role of educators in helping children develop environmental awareness and knowledge. In their understanding of children's knowledge and awareness, several researchers regard the educator's role as crucial (Doyle, 1977; Sethusha, 2006). As Chacko (1998) notes that "better informed and trained educators can help students become more aware of the environment with the application of some teaching methods at school" (p.66). On the other hand, environmental education is not restricted to in-class lesson plans. There are numerous ways children can learn about the environment in which they live. From experiential lessons in the school yard and field trips to national parks to after-school green clubs and school wide projects, the environment is a topic which is readily and easily accessible (Smyth, 2006).

It has been known that the basic for many environmental problems are irresponsible environmental behaviour. One of the most important influences on behaviour is the attitude. Young people's and children's attitudes are particularly crucial since these people ultimately will be affected by and will need to provide solutions to environmental problems

arising from present-day actions (Bradley, Waliczek & Zajicek, 1999). Therefore, it appears that effective environmental education for students is very important. In general, childrens' attitudes towards the environment and environmental issues begin to develop at a very earlier age. In this sense, it can be stated that increased knowledge about the environment promotes positive attitudes (Bradley, Waliczek & Zajicek, 1999). According to Şimşekli (2010), "achieving a sufficient and efficient environmental education for children would be the most important step taken on the way to prevent the probable serious environmental problems in the future. However, the place, content and methods of the environmental education in syllabuses are still a controversial matter" (p.552).

Like in many other countries, the topics about the environment are covered in syllabus within the framework of Science and Technology Education course in Turkey (Erdoğan, Kostova, & Marcinkowski, 2009; Kiziroğlu, 2000; Stokes, Edge, & West, 2001). There are studies on how formal and informal (Palmer, 1998; Wojcik, 2004) educational processes treat the issues such as children's *sensitivity to environment* and *environmental consciousness* (Atasoy & Ertürk, 2008; Gooch, 1995; Gökçe, et al., 2007; Özmen, Çetinkaya, & Nehir, 2005; Scott & Willits, 1994; Yılmaz & Andersen, 2004; Wysor, 1983), *the place and scope of environmental education* in syllabuses (Brown, 1997; Grodzinska-Jurczak, 2004; Hassan, Juahir, & Jamaludin, 2009; Hungerford & Volk, 1990; Jacobs, 1995; Jeronen, Jeronen, & Raustia, 2009; Schlottmann, 2009; Skanavis & Sarri, 2002; Stevenson, 2007; Ünal & Dımışkı, 1999), and the *shortcomings in the sources and practices* (Ballantyne & Packer, 1996; Disinger, 1982; Palmer, 1993; Goussia-Rizou & Abeliotis, 2004; Dunlap & Van Liere, 2008; Kostove & Atasoy, 2008; Schlottmann, 2009; Şimşekli, 2010), attest to the *importance of environmental education* and the necessity that it be given a broader scope with different instructional methods and syllabuses (Şimşekli, 2010).

The greatest part of the environmental education is given via science and technology, geography and biology courses before university education (Demirkaya, 2006). In this regard, for many years to get rid of difficulties in environmental education and to satisfy the needs of students and the society, new approaches for raising students' environmental awareness knowledge and attitude levels have been proposed. There are lots of different learning theories that can be used to help guide a teaching/learning process. One of them is *the theory of multiple intelligences*.

Multiple Intelligences Theory

Using Gardner's (1993) theory of multiple intelligences proposes a means to understanding many ways in which people are intelligent. That explains how we process, learn, and remember information, in contrast to the

prevailing notions of intelligence testing, which posit a general intelligence (Goodnough, 2001). Gardner (1993, 1999, 2000) states that while individuals are capable of processing information in at least eight different ways.

Gardner's theory is generally centred on the premise that there are many different types of talents or knowledge that could help to enrich one's life and respond effectively to one's environment (Douglas, Burton, & Reese-Durham, 2008, p.182). The end product of his research is the eight intelligences: (1) visual-spatial- capacity to perceive the visual-spatial world accurately and to modify or manipulate one's initial perceptions (2) bodily-kinaesthetic- abilities to control one's body movements and to handle objects skillfully (3) musical-rhythmical-abilities to produce and appreciate rhythm, pitch, and timbre, and appreciation of the forms of musical expressiveness (4) interpersonal-capacities to discern and respond appropriately to the moods, temperaments, motivations, and desires of other people (5) intrapersonal- knowledge of one's own feelings, strengths, weaknesses, desires, and the ability to draw upon this knowledge to guide behaviour (6) logical-mathematical- the abilities to discern logical or numerical patterns and to handle long chains of reasoning and (7) verbal-linguistic-sensitivity to the sounds, rhythms, and meanings of words; sensitivity to the different functions of language (8) naturalistic- the potential for discriminating among plants, animals, rocks, and the world around us, as used in understanding nature, making distinctions, identifying flora and fauna (Douglas, Burton, & Reese-Durham, 2008, p.182-183). In light of this, the application of the theory comes in the form of making use of instructional techniques that align with the standards and practices of Multiple Intelligences.

It is crucial for teachers to care about multiple intelligences in their courses. There are ten top reasons why teachers should care about Multiple Intelligences in the classroom of which using of multiple intelligence in the classroom will better prepare students for tomorrow's complex making, making the curriculum accessible to all students, and making the content area engaging and exciting to all students are only three (Kagan, 2000). Students should be taught based on their ability and ways of learning; active and involved teaching is a step towards students' academic success. Multiple Intelligences theory asks the question, in what ways are students smart, rather than, are they smart. Teachers generally adopt the belief that most of the students are capable of achieving; Multiple Intelligences instructional strategy considers this and indicates the materials, instructional strategies that will bring forth such success (Denig, 2004).

Traditionally, school has been directed at verbal-linguistic and logical-mathematical intelligences (Emig, 1997). Students who are weak in neither of these intelligences are usually disadvantaged in school. The learning of science should entail more than the verbal-linguistic and logical-

mathematical intelligences; teachers should capitalise on all ways of knowing (or all of the multiple intelligences) in order to make science more meaningful, relevant, and personalised for all students (Goodnough, 2001).

Multiple Intelligences theory offers teachers eight ways of teaching and eight ways of learning to students. The theory of Multiple Intelligences offers eight ways of teaching and learning styles. In this regard, armed with the knowledge and application of the multiple intelligences, teachers can ensure they provide enough variety in the activities they use so that as much of their pupils' learning potential can be tapped as possible (Baş, 2010). Some teachers are not in favour of using Multiple Intelligences in the classroom since there occurs some problems (Baş, 2010) and some of the teachers are strictly tied to traditional methods of instruction, because it is very easy to use traditional methods of instruction so that the teacher generally address the information verbally and the students have to listen to it carefully and get what they hear. In this sense, traditional instruction involves teachers' detailed lecture or presentation and students' questions during or after the session. On the whole, the students remain passive in the class (Demirel, 2005). Teachers want to make their students learn things shortly and fast and also traditional instruction methods save time so that teachers mostly prefer traditional methods of instruction in their classrooms (Ahmad & Mahmood, 2010). However, teachers using Multiple Intelligences have to work hard on the course plan and organise the learning environment in order to address in eight ways of learning to the students in the classroom. The work of Vygotsky (1978) is very important since he emphasised the role of "social atmosphere/interaction". He sees children as constructing their understating from the social interaction of their learning contexts with all its possibilities and limitations. In this regard, as Anning (1991) suggests that children are unique in what they bring to the learning experience but tend to draw on the same kinds of learning strategy. This means that we must think of learners as having individual differences so that teachers need to pay attention to the organisation of their classrooms. They must also consider their students' "intelligence types/profiles" (Gardner, 1993) in the classroom.

Reviewing the literature about the environmental education, multiple intelligences and its applications in classrooms revealed that many schools started to integrate the Multiple Intelligence instruction strategy into their classrooms and even whole curriculum and many researchers have carried out studies to investigate the effects of this strategy on many disciplines apart from science and technology. Various studies about Multiple Intelligences instruction strategy yielded different results in terms of its usage in classrooms. Therefore there is a need to investigate the effects of Multiple Intelligences instructional strategy in the environmental education at elementary level of education.

Several researchers have noted that the knowledge and awareness of students with regard to the environment are at a low level (Sethusha, 2006). So, the current research examines how Multiple Intelligences instructional strategy affects the environmental awareness knowledge and environmental attitude levels of students in Science and Technology course. The results suggest that performance on a post environmental education assessment for students exposed to Multiple Intelligences instructional strategy will show considerable increase when compared to those taught using traditional methods of instruction.

It is suggested that in our educational system that we have emphasised the linguistic and logical-mathematical intelligences. As we learn more about the mind and how it learns, we should consider earning activities that draw on a wider variety of intelligences and give students a better chance to develop their strengths, apply them to a greater range of problems and challenges, and showcase their knowledge and attitude levels (Alaz, 2009).

The main purpose of this study is to stress the importance and functions of the techniques and methods which take into consideration students' individual differences. In this regard, it is believed that students will gain the needed knowledge, awareness and attitudes towards the environment in terms of learning by multiple intelligences strategy. The applications in this study are believed to be used widely in the environmental education whether the applications become successful.

The research was done for determining the applicability of multiple intelligence theory on the environmental education and aiming to show the effects of this theory to the students' environmental awareness knowledge levels and attitudes towards the environment which inclined environmental education for developing in a positive way.

The problem of the current research was to determine whether elementary students achieve higher environmental awareness knowledge and environmental attitude levels when they are taught using Multiple Intelligence instructional strategy than when they are taught using the traditional methods of instruction. Subsequently, the aim of this research was to summarise and evaluate the subset of literature that has special relevance to the comparison of Multiple Intelligence instructional strategy and traditional methods of instruction.

In order to identify the differences between the students of the experiment group and the students of the control group, the following sub-problems were tried to be evaluated in the light of the acquired data in the study:

1. Is there a significant difference between the environmental awareness knowledge test scores of the students in the experiment group

and the students in the control group in terms of the usage of Multiple Intelligences in the teaching process?

2. Is there a significant difference between the environmental attitude test scores of the students in the experiment group and the students in the control group in terms of the usage of Multiple Intelligences in the teaching process?

Methodology

Research Design

An education programme was prepared in order to make students develop their environmental awareness knowledge and attitude levels. In this study, an experimental method with a control group has been used (Karasar, 2005) in order to find out the difference between the students who were taught by multiple intelligences instructional strategy in the experimental group and the students who were taught by traditional instructional methods in the control group. The pre/post-test group research model is one of the most widely used research models in educational sciences (Dugard & Toldman, 1995).

Both groups were employed a pre-test and pre-attitude test prior to the experimental process. The subjects were given an environmental awareness knowledge and attitude scale tests towards the environment as a pre-test. Meanwhile, both the environmental awareness knowledge and attitude scale tests were employed to both groups after the experimental process as a post-test. Pre-test/post-test experimental design with a control group was used in the study (Karasar, 2005; Kerlinder, 1973). In this design, which uses two groups, one group is given the treatment and the results are gathered at the end. The control group receives no treatment, over the same period of time, but undergoes exactly the same tests (Kerlinder, 1973). A small number of homogenous subjects provided us with information over a period of four weeks. To begin with, the subjects described what they actually did in the process of Multiple Intelligences instructional strategy.

Subjects of the Study

Two classrooms of 7th grade class students from an elementary school in Nigde, Turkey formed the subjects of the study. This study was performed amongst 60 elementary school students. 30 students from the 7-A class formed the experiment group and the rest of the students (30 students) from the 7-C class formed the control group of the study. The main reason for choosing this level was that in the reaching sequence of Turkish science and technology classes, topics related to the environment is first introduced to students at this level in the integrated science and technology courses. All of the students in the study were about 13 years old. There were 18 (60%) male, 12 (40%) female students in the experimental group and 16

(53%) male, 14 (47%) female students in the control group. The families of the students in both groups had similar socio-economic backgrounds. The groups can be seen in the experimental design in Table 1 below:

Table 1. Organisation of the experiment and the control groups

Experimental Group	The group on which multiple intelligences instructional strategy was applied
Control Group	The group on which traditional instructional methods were applied

In order to investigate students' environmental awareness knowledge levels and their attitudes towards the environment, a specific lesson plan was prepared for the students in the experimental group. The environmental awareness knowledge and the attitude scale tests towards the environment were administrated to both groups in a single session as a pre-test. In four weeks, the experiment group was given various strategies for multiple intelligences in the teaching session, but not the control group. Four weeks later, each of the groups was administrated the environmental awareness knowledge and the environmental attitude scale tests given as a post test. As Manson & Bramble (1997) pointed out that the longer the time spent, the greater the probability that something could influence the subjects' environment that in turn would affect the results. Duration of four weeks was deemed appropriate to see the effects of the experimental treatment.

Procedures of the Study

In the experiment group, the following procedures have been applied. In the control group, traditional instructional methods have been used in the process of the study. The design of the study can be described as in the table below:

Table 2. Experimental design used in the study

Groups	Pre test	Experimental Design	Post test
Experiment	$T1_{12}$	Multiple Intelligences Strategy	$T2_{12}$
Control	$T1_{12}$	Traditional Instructional Methods	$T2_{12}$

$T1_1$ $\longrightarrow$ Environmental Awareness Knowledge Test

$T1_2$ $\longrightarrow$ Environmental Attitude Scale Test

As can be seen in Table 2 above, one can see the scales applied on the subjects of the study. The environmental awareness knowledge and attitude scale tests were applied on the subjects of the study for two times before and after the experimental process.

This instructional treatment was conducted over four weeks in the 2009-2010 first term at an elementary school in Nigde, Turkey, 7th grade students of two classes were enrolled in the study. The classes were selected randomly from the other classes of the elementary school. Firstly, the environmental awareness knowledge and the environmental attitude tests were performed as a pre-test. In the next step, the environmental awareness courses of the elementary school 7th grade students were taught to the control group by using the traditional instruction methods and to the experiment group by using the Multiple Intelligences strategy.

After the environmental topics to be studied were selected, the researcher developed related activities for the procedure. It was crucial to develop appropriate techniques and provide necessary materials that reflect the principles of Multiple Intelligences Theory. Drawing on relevant research all activities were developed by the researcher. Lesson plans for the procedure were based on Gardner's (1993, 1999) suggestions on teaching for a deep learning. In this study, experiment group studied the topics of the environment through Multiple Intelligences based activities while the control group studied the same topics through more traditional activities.

In the control group, the teacher directed strategy represented that the traditional instructional methods were used in the course. The student was instructed only with traditionally designed environmental text. Mostly of time, the teacher presented the topic and the students listened to their teacher and answered the questions asked by their teacher. At the same time they carried out activities in their text-books. The instruction for the control group varied in the following ways. In terms of direct instruction, the practice best applicable to this method was drill and practice; students were taught the objectives through teacher-directed lectures, notes on the overhead, notes on the board, practice problems from the textbook, teacher developed worksheets, and the student workbook, which accompanies the text. However, in the experimental group, the activities were prepared in light of Multiple Intelligence theory. Different types of activities were taken for different types of intelligences of students by taking the lesson plan samples prepared for the Multiple Intelligences instruction strategy.

The environmental awareness course assessed was developed and taught as a separate course of science content courses in elementary education. All courses attempted to model eight ways of multiple intelligences. The course structure incorporated two major conceptual frameworks for instruction. One was the multiple intelligences learning ways (Armstrong, 2000), and the other was a model for teaching environmental education which incorporated understanding ecological and environmental concepts with values clarification and action group projects (Van Matre, 1990). In the beginning of the study, the students were appointed to eight multiple intelligences heterogeneous centres. These

heterogeneous centres were created according to the principles of multiple intelligences theory. The students were given subjects dealing with some of the topics of the environment such as "air/water/soil pollution, global warming, tree/forest protection, forest fires, erosion, etc." The students worked in identical multiple intelligences centre so that the students were made to work on at least four different subjects of the environment in the centres.

Firstly, students studied the environmental topics in working centres. The experimental process of the study was as below:

Table 3. Experimental process applied in the study

Verbal-Linguistic Intelligence Centre	The procedure started with a reading session as a whole class-activity. The reading text, which was about the environment and its problems, was written by the researcher. It was hoped that this topic would be interesting for the students especially for the ones with highly developed verbal-linguistic intelligence. Before the text was given to students, some pictures of the environment and its problems were demonstrated to draw students' attention and provide a preparation for the topic to be taught. The students were asked some questions about the text itself
Musical Intelligence Centre	The participants listened to a selection of the environmental problem sounds (i.e., sound of a fire, flood, etc.). As a second musical activity, they learnt a song adapted and changed from English into Turkish, "We are the World". The lyrics of this song were changed by the researcher in order to cover the basic vocabulary and insight of the environment.
Visual-Spatial Intelligence Centre	Students watched some documentary on the problems of the environment. Also, they were made to draw pictures on the problems of the environment and these pictures were demonstrated at school.
Bodily-Kinesthetic intelligence Centre	The students played a game which was developed by the researcher and then they acted out a drama which reflected the problems of the environment at school.
Interpersonal Intelligence Centre	Students organized an "environment club" at school and then made short visits to the classrooms in their school and to the people in their hometown and informed them about the problems of the environment. They also published information cards about the problems of the environment and then distributed them both to the students and the people around.

(Table continues)

Table 3. (continued)

Intrapersonal Intelligence Centre	Students were given pictures about the past and the present conditions of the world and they were asked to compare these pictures and then empathise the people and animals living in these places of the world.
Naturalist Intelligence Centre	Students tripped to the rural area of the city and some of the environmental problems were introduced and then students were made to plant trees in the garden of their school. Also, in this intelligence centre, students were provided with a map of the world on which various environmental problems were distributed according to their hometowns along with their features, there were also many environment and nature magazines both in English and Turkish languages.
Logical-Mathematical Intelligence Centre	Students investigated the environmental changes of their hometown during ten/twenty years via the Internet and other sources.

Secondly, the students created projects and activities according to the profile of their intelligence centre. When the students created their projects, they were reassigned to different groups in order to make them work in different multiple intelligences centres. The students studied on the environment by using different means of learning such as reference books, the internet, video conferencing, interviewing, etc. The students also learnt more from other resources including the teachers at school. In this process, the teachers helped the students for finding the materials and information, etc. for the creation of their projects. Following the learning cycles, students participated in collaborative action group team which selected a local or regional environmental issue and studies them in both scientific and social contexts. The students in these multiple intelligences centres studied in eight groups so that they studied to gain awareness towards the environment. The main aim in this education was to develop skills and qualifications important for nature conservation, such as sensitivity for the environment, knowledge about nature and ecology, environmentally responsible emotions and values, understanding of environmental questions, critical thinking skills, social action skills, ethical growth, and responsible environmental behaviour (Jerosen, Jerosen, & Raustia, 2009).

Instruments

Environmental awareness knowledge test. In order to collect the data related to environmental awareness knowledge of the students, "the environmental awareness knowledge test" developed by the researcher was

conducted. A multiple-choice test including fifty items (each item is 2 points; total score is 100), the reliability and validity of which have been made. This test is used to measure the students' knowledge levels of the environmental awareness. The test items which measure the objectives of environmental awareness knowledge levels of the students in the science and technology course in the elementary school curriculum in Turkey.

The test was administrated on a total number of seventy-five students in an elementary school. In the first place, the item and test statistics of the achievement test were computed for reliability and validity. The reliability of the knowledge test was done by KR-20 method (Tekin, 1996; Yılmaz, 1998) so that the reliability value of the test was found as $r = .84$ and the test difficulty (Pj) was found as .57 and the test discrimination (rjx) was found as .45 so that it is revealed that the test is reliable and it was applied on the students both in the experiment and the control groups.

Table 4. Statistics for the environmental awareness knowledge test

Number of the Students	Number of the Question	$\overline{X}$	Std. Dev.	KR-20	Average Test Difficulty	Average Discrimination of the Test
60	50	66.82	11.04	0.84	0.57	0.45

As looked at the table above, the environmental awareness knowledge test has a reliability of .84, an average level of test discrimination (.45) and an average level of test difficulty (.57). In the light of the data gathered for the knowledge test, it can be said that the test has a high level of reliability, a medium level of difficulty and a high level of test discrimination.

Environmental attitude scale test. In this research, the "*attitude scala towards the environment*" was used in order to measure students' attitudes towards the environment. The scale was developed by Leeming, Dwyer & Bracken (1995). The scale was rearranged by having done the reliability and validity studies and used to evaluate the attitudes of elementary school students towards the environment by Aslan, Sağır, and Cansaran (2008). The scale was both translated and then adapted into Turkish by the researchers themselves. In the reliability and validity studies of the scale, the survey model was used. The attitude scale test was applied to measure the attitudes of the students towards the environment in the study. The attitude scale test is a *five-point likert type scale* (which was used to differentiate orientations from 1 as *low* and 5 as *high*) reliability and validity of which have been made by t-test, including 24 items that measure students' attitudes towards the environment. The reliability value of the attitude scale test was found as $r = .86$ and the *Cronbach's Alpha* value was found as $α = .86$. The mutual factor variances of the items differ between .333 and .717 in the scale. The Kaiser-Meyer-Olkin (KMO) sampling adequacy result was found as .874 and the Bartlett test result

was found as $\chi^2 = 2279.979$ ($p = .000$). These results show that there is a strong correlation amongst the items. In light of the data, it can be said that the attitude scale test is both reliable and valid to be used in the current research.

Analysis of the Data

In this study, the statistical techniques such as *mean* ($\overline{X}$), *standard deviation* (Std. Dv.) and *t-test* were used in the analysis of the data. *P value* was held as 0.05. Significance level was decided by taking p values into consideration $p > 0.05$, meant there was not a meaningful difference, $p < 0.05$ meant there was a meaningful difference. The statistical analyses have been made by means of *SPSS 15.0* statistical package programme for windows.

Limitations of the Study

Small sample size is one of the limitations of the study. The number of the participants in the study was limited to the number of 7th grade class students (totally 60 students) in an elementary school in Nigde, Turkey. Another limitation arises from the subject of science and technology course since "*human and environment unit*" was used in the experiment and the control groups. In the experiment group, Multiple Intelligences instructional strategy was used. In the control group, traditional instructional methods were used in the study. On the other hand, the study is also limited to the statistical evaluation of comparison of pre-test and post-test of students.

It was aimed to examine and observe how the Multiple Intelligences instructional strategy influences students' gaining of environmental awareness knowledge and environmental attitudes in this study. The findings obtained from this study cannot be generalized to other settings.

Findings

Analysis of the 1st Sub-Problem

The first sub-problem of the study was "Is there a significant difference between the environmental awareness knowledge test scores of the students in the experiment group and the students in the control group in terms of the usage of Multiple Intelligences in the teaching process?"

Table 5. Comparison of pre-test scores of the students in the experiment and the control groups

Groups	N	$\overline{X}$	Std. Dv.	df	t	p
Experiment	30	19.0	12.2			
Control	30	19.9	12.1	58	-0.277	0.78

In Table 5 above, the pre-test environmental awareness test scores of the students in the experiment group and the control group have been

compared. The average score of the students in the experiment group has been found as $\overline{X}$ = 19.0±12.2; and the average pre-test score of the students in the control group has been found as $\overline{X}$ = 19.9±12.1. The difference between the students of these two groups has been analysed through the independent t-test. The accounted t-value is $t_{(58)}$ = -0.277. According to these results, there is no statistically significant difference between the pre-test scores of the students of these two groups in 0.05 level (p = .78, p > .05).

Prior to study's experimental process, it can be said that both groups' pre-learning levels on the environmental awareness knowledge levels are equal to one another.

Table 6. Comparison of post-test scores of the students in the experiment and the control groups

Groups	N	$\overline{X}$	Std.Dv.	df	t	P
Experiment	30	60.8	11.8			
Control	30	47.5	13.8	58	4.02	0.0002*

The post-test environmental awareness test scores of the students in the experiment and the control groups have been compared in Table 6 above. The average post-test score of the students in the experiment group has been found as $\overline{X}$ = 60.8±11.8; and the average post-test score of the students in the control group has been found as $\overline{X}$ = 47.5±13.8. The difference between the two groups has been analysed through the independent t-test. The accounted t-value is $t_{(58)}$ = 4.02. The students in the experiment group ($\overline{X}$ = 60.8) showed significant environmental awareness knowledge levels compared to the students in the control group ($\overline{X}$ = 47.5). So according to these results, it can be said that there is a statistically significant difference between the post-test scores of the two groups in 0.05 level (p = .0002, p < .05). In this regard, it can be clearly stated that the students gained more environmental awareness knowledge compared to those in the control group. Activities based on Multiple Intelligences theory have more positive impact on the students for gaining knowledge on the environmental awareness than the students who are taught by traditional instructional methods.

Analysis of the 2nd Sub-Problem

The second sub-problem of the study was "Is there a significant difference between the environmental attitude test scores of the students in the experiment group and the students in the control group in terms of the usage of Multiple Intelligences in the teaching process?"

Table 7. Comparison of pre-test attitude scores of the students in the experiment and the control groups

Groups	N	$\overline{\mathbf{X}}$	Std.Dv.	df	t	p
Experiment	30	2.00	1.26			
Control	30	2.03	1.22	58	-0.104	0.92

In Table 7 above, the pre-attitude scores of the students in the experiment and the control groups could be seen. The average pre-test attitude score of the students in the experiment group has been found as $\overline{X}$ = 2.00±1.26; and the average pre-attitude score of the students in the control group has been found as $\overline{X}$ = 2.03±1.22. The accounted t-value between the average scores of the two groups is $t_{(58)}$ = -0.104. The data obtained are not statistically significant in 0.05 level since the pre-test attitude scores of the students in these two groups are similar.

Table 8. *Comparison of post-test attitude scores of the students in the experiment and the control groups*

Groups	N	$\overline{\mathbf{X}}$	Std.Dv.	df	t	p
Experiment	30	4.17	0.874			
Control	30	2.83	1.37	58	4.50	0.0001*

The post-attitude scores of the students in the experiment group and the control group can be seen in Table 8 above. The average post-attitude score of the students in the experiment group has been found as $\overline{X}$ = 4.17±0.874; and the average attitude post-test score of the students in the control group has been found as $\overline{X}$ = 2.83±1.37. The t-test value obtained from the average scores of the two groups is $t_{(58)}$ = 4.50 which shows a statistically significant difference (p = .0001, p < .05). In light of the data acquired in the research, it can be said that the students in the experiment group have reached higher attitude scores compared to those in the control group. The experiment method where multiple intelligences based teaching was applied has enabled the students to develop positive attitudes towards the environment.

Conclusion

On the basis of the findings in the research above, the following conclusions can be put forward below:

1. There is a significant statistical difference between the environmental awareness knowledge levels of the students who have been educated by multiple intelligences strategy and the students who have been educated by the traditional instructional methods.

The students who have been educated by multiple intelligences strategy have gained more environmental awareness knowledge than the students who have been educated by the traditional teaching methods.

2. In terms of the attitude towards the environment, there is a significant statistical difference between the experiment group and the control group. The students who have been educated by multiple intelligences strategy have been found out to have more positive attitude levels to the environment than those who have been educated by the traditional instructional methods.

Discussion

As a result of the study, it was found out that there is a significant statistical difference between the environmental awareness knowledge levels of the students who have been educated by multiple intelligences strategy and the students who have been educated by the traditional instructional methods. The students who have been educated by multiple intelligences strategy have gained more environmental awareness knowledge than the students who have been educated by the traditional teaching methods. The results of this study are consistent with the larger scale research conducted by the creator of Multiple Intelligences and its principles, Gardner, in which the purpose was to understand and enhance learning, thinking, and creativity in the arts, as well as humanistic and scientific disciplines, at the individual and institutional levels (Douglas, Burton, & Reese-Durham, 2008). As Al-Balhan (2006) reported that the students whose multiple intelligences were applied to learning, performed better overall academic success than the students in the control group who studied traditional teaching methodology. Although there are few studies which work directly on the effects of multiple intelligences on environmental education (Çolak, 2005), there are studies which reflect the effects of multiple intelligences on other subjects. The findings obtained from this study, resembles other studies which evaluate the instruction methods depending upon Multiple Intelligences Theory for the student success, knowledge levels and attitudes. In the studies carried out on Multiple Intelligences, it has been seen that Multiple Intelligences Theory has increased the success, conceptual understanding and attitudes of students, when compared with traditional methods of instruction (Kaya, 2002). Some other studies support our results. For example, Ucak, Bag, & Usak (2006) investigated whether there is a significant difference between multiple intelligence instruction and traditionally designed science instruction on students' understanding of concept with the "the Structure of material and its transformation" unit. As a result of this study it was found out that multiple intelligence theory, when compared to the

traditional instruction methods, created positive effects on students' knowledge levels. The studies carried out by Acat, (2002), Açıkgöz, (2003), Akamca and Hamurcu, (2005), Alaz, (2009), Bümen (2001), Campbell (1989), Canbay (2006), Coşkungönüllü (1998), Dilek (2006), Douglas, Burton, and Reese-Durham (2008), Gazioğlu (2006), Güneş (2002), Gürçay and Eryılmaz (2005), Kaptan and Korkmaz (2000), Kaya (2002), Korkmaz (2001), Mehta (2002), Nyugen (2000), Oran (2006), Öz (2005), Özdemir (2006), Şahin (2001), Sezginer (2000), Temur (2007), and Yıldırım and Tarım (2008) have parallel results with the results of the current study.

In terms of the attitude of students towards the environment, it was found that there is a significant statistical difference between the experiment group and the control group. The students who have been educated by multiple intelligences strategy have been found out to have more positive attitude levels to the environment than those who have been educated by the traditional instructional methods. In this regard, it can possibly be said that the results of the current study show that students have positive attitudes towards the environmental problems. These results support the findings of previous studies that showed students' positive attitudes towards the environment. For example, the results of the studies carried out by Akamca and Hamurcu (2005), Bümen (2001), Dilek (2006), Gazioğlu (2006), Kaptan and Korkmaz (2000), Kaya (2002), Korkmaz (2001), and Şengül and Öz (2008) correlate with the results of the current study. On the other hand, there are other studies which reflect the positive results of the environmental education on students' attitudes towards the environment. For instance, Smith-Sebasto and Cavern (2006) studied the effects of pre- and post trip activities associated with a residential environmental education experience on students' attitudes towards the environment. At the end of this study, it was revealed that students who were educated with pre- and post trip activities associated with a residential environmental education gained more positive attitudes towards the environment. This conclusion correlates the conclusion of our study since the students in the current study made environmental trips and planted trees on some of the places in the garden of their school in terms of by using the "natural intelligence" of the theory of Multiple Intelligences. Çolak (2005) investigated the application on the environmental education by using the theory of multiple intelligences so that he found out that the students showed more positive attitudes towards the environment than those which traditional instructional methods were used. In a similar study, Kyridis *et al.* (2005) analyzed the attitudes of pedagogical students towards environmental education in Greece. The results of this study show that pedagogical students have not only realized the importance of environmental education in primary education but have also been sensitized to the environment and the issues involved in this. Attending practical courses on the environment seems to help towards this sensitivity. In this regard, the students participated in our study stated

that they have liked the environment very much and have gained sensitivity towards the environment and its problems so that the conclusion of Kyridis *et al.* (2005) correlate with the results of our study. Some other studies support our results. For example, the results of the studies carried out by Al-Raabani and Al-Mekhlafi (2009), Bradley, Waliczek, and Zajicek (1999), Brown (1997), Cohen and Wingerd (1993), Demirbaş and Pektaş (2009), Jaus (2006), Soussan (1992), Stepaniak *et al.* (1998), and Volk and Cheak (2003) correlate with the results of the current study.

Champell (1997) states that in the primary school whose instruction is arranged with activities that include the eight fields of the theory, the applications provide the satisfaction of student, teacher and parents. Hoerr (2004) states that Multiple Intelligence Theory affects the instruction styles undoubtedly, but looking at the Multiple Intelligences theory only in terms of instruction and pedagogy means ignoring its great contributions in New City School. Bradley, Waliczek, and Zajicek (1999) in their study found out that there is a significant relationship between students' environmental knowledge and environmental attitudes since it is assumed by some that increased knowledge about the environment promotes positive attitudes (Arcury, 1990; Arcury & Christianson, 1990). In the current study, results indicated significant differences in both knowledge gain and attitudes of students after exposure. Students' environmental knowledge scores increased after they completed the environmental science education based on Multiple Intelligences instructional strategy. In addition, the students' environmental attitudes became more environmentally favorable. These results of the current study correlate with the results of the studies carried out by Arcury (1990) and Arcury and Christianson (1990).

As a result of the obtained results from the study; it is seen that the instruction strategy depends upon the Multiple Intelligences instructional strategy has made positive contributions for the students' attitudes towards the environment and their environmental awareness knowledge levels. The thoughts of the experiment group about the studies in the lesson and the class activities made support to the statistical findings. It has been observed that the experimental group, during the lesson, participated actively in practices like writing poems and stories, composing/singing songs, drawing schema/pictures which summarize what they understand, using worksheets, playing games amongst groups. Besides, the students stated that they took pleasure from the course and they did not get bored during the courses. The researcher in this study saw that the analysis of the experimental study has indicated that the experimental group students' environmental awareness knowledge level was significantly higher than those taught using traditional instructional methods. The most important thing in the research was the experimental

group students had more fun when they were learning so that they did, touched, saw, and talked about the things they learnt and they also had the change of socialization and cooperation which are more important for them in these ages (Piaget, 1951; Vygotsky, 1962). The researcher also sees that Multiple Intelligences instructional strategy helps students develop such skills as; physical, intellectual, social and emotional skills which are the skills the students have to develop. In the process of the experimental instructional study, students used different types of intelligences. In the experimental process, the students created projects integrating eight types of intelligences in the theory of Multiple Intelligences. By this way, the students not only had high environmental awareness knowledge levels in science and technology course, but they also had chance to practice their different skills such as drawing, writing, thinking, criticizing, etc. as well as using their different intelligence types like spatial, musical, verbal, social intelligences, vs.

Due to the length of the current research conducted, two of the four improvements were observed: improved environmental awareness knowledge levels and positive environmental attitude improvements. Therefore, it can be concluded that as compared with the traditional instructional methods, Multiple Intelligences strategy garners significant increases in several areas of importance to a student's academic, social, and emotional well-being. In the classroom, this task is accomplished by developing innovative lesson plans that will meet the needs of a diverse learning population. In conclusion, on the basis of the gathered findings in the study it can be said that Multiple Intelligences instructional strategy can be used in the environmental education effectively.

Suggestions

As a result of this study, in which the effects of multiple intelligences learning strategy on attitude levels of students towards the environment have been examined, the following suggestions can be given depending on the findings obtained in the research:

1. In light of the gathered data in the study, Multiple Intelligences strategy has been found out to be more effective on students' environmental awareness knowledge levels and attitudes towards the environment than the traditional instructional methods. So, it is recommended that the teachers should use this strategy in the environmental education in a separate course or in science and technology courses.

2. Seminars and courses should be organized so as to train teachers both on the theory and practice to use this strategy effectively in

their classrooms so that they can create a more positive classroom atmosphere for the environmental education.

3. Teachers should direct the process of the strategy effectively so that if they cannot direct the strategy effectively, students can be frustrated and demoralized, they can be bored with the activities so that the strategy can be unsuccessful from the beginning of the process of instruction.

4. Teachers should try to use eight types of intelligences in the theory of multiple intelligences as far as they can.

5. Subjects should be added in elementary courses in order to develop students' environmental awareness and environmental attitudes by using the theory of multiple intelligences.

6. A specific "environmental education" course should be implemented in the elementary curriculum so that students can develop positive environmental attitudes and gain environmental awareness from the earlier ages.

7. Environmental education should be made so as to make students participate in activities (i.e., indoor or outdoor) actively so that the activities should be organized carefully.

8. "Environmental Protection" clubs in elementary schools should be developed in order to better train students so as to make them gain more environmental awareness and positive environmental attitudes.

9. The school curriculum should be reassessed and then the environment awareness units should be integrated with the other school subjects at elementary level of education. In this regard, students should be educated on the environmental problems and issues not only in science and technology course, but they should also be educated on the environmental problems and issues during the other courses at school.

10. Further studies should be carried out on the effectiveness of multiple intelligences on the environmental education in elementary schools in different districts.

11. Further studies should be conducted using Multiple Intelligences in other subject areas.

12. Studies should also be conducted in different cultures amongst students attending private and government institutions as well as different residential areas.

13. Studies should be carried out in order to reflect the views of parents.

◆   ◆   ◆

Biographical statement

Gökhan Baş, MS, works in Selcuk University Educational Sciences Department. His research interests include educational administration and supervision, curriculum and instruction, educational psychology, multiple intelligences, environmental education, computer assisted language teaching, and educational measurement and evaluation. He has had many published international and national articles in the stated disciplines. He has the award of International English Education Research Association's 2009 outstanding article award.

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