AN EXAMINATION OF INDICATIONS FOR A GREEN CURRICULUM APPLICATION TOWARDS SUSTAINABILITY

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ABSTRACT

AN EXAMINATION OF INDICATIONS FOR A GREEN CURRICULUM APPLICATION TOWARDS SUSTAINABILITY

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The aim of this study is four fold: (1) to determine Middle East Technical University (METU) students' familiarity and current understandings of sustainable development, and their views on sustainable living at the campus; (2) to explore their attitudes toward sustainable development, behaviors toward sustainable life styles, and environmental values; (3) to examine their perceptions of their own and society's future; (4) to investigate the significant predictors of their environmental values, and attitudes and behaviors toward sustainable life styles. In addition, Faculty of Education students as future implementers of sustainability education were under investigation with regard to sustainability concerns.

The data were collected by online administration of measuring tool to 958 METU students in February-June of 2008. This measuring tool was also administered to 688 Faculty of Education students in classroom environment by the researcher. The results showed that there exist some knowledge gaps in university students' perceptions toward different aspects of sustainable development. Furthermore, the respondents had favorable attitudes toward

sustainable development and intrinsic values toward the environment. However, looking at the personal behavioral changes, their preferred individual ways of living were not necessarily coherent with sustainability. The results revealed that female students having higher tendency to follow media held more favorable attitudes and behaviors toward sustainable life styles, and more intrinsic environmental values. Moreover, attitudes and values were found to be significant determinants of university students' behaviors toward sustainable life styles. Interestingly, Faculty of Education students' attitudes were not significantly related to their behaviors toward sustainable life styles.

Keywords: Education for Sustainable Development, Attitudes towards Sustainable Development, Environmental Values, Behaviors toward Sustainable Life Styles, Sex

ÖZ

SÜRDÜRÜLEBİLİRLİĞE YÖNELİK YEŞİL BİR MÜFREDAT UYGULAMASI İÇİN GÖSTERGELERİN İNCELENMESİ

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Bu çalışmanın amacı dört basamaktan oluşmaktadır; (1) Orta Doğu Teknik Üniversitesi (ODTÜ) öğrencilerinin sürdürülebilir kalkınma üzerine anlayışlarını ve kampüste sürdürülebilir yaşama yönelik görüşlerini belirlemek; (2) sürdürülebilir kalkınmaya yönelik tutumlarını, sürdürülebilir yaşam biçimlerini destekleyen davranışlarını ve çevresel değerlerini araştırmak; (3) kendilerinin ve toplumun geleceğine yönelik algılarını incelemek; (4) çevresel değerlerinin, sürdürülebilir yaşam biçimlerini destekleyen davranışlar ile tutumlarının anlamlı belirleyicilerini araştırmaktır. Ek olarak, Eğitim Fakültesi öğrencileri sürdürülebilirlik için eğitimin gelecekteki uygulayıcı olarak bu değişkenler kapsamında incelenmiştir.

Bu çalışmada ölçüm aracının Şubat-Haziran 2008 döneminde internet üzerinden toplam 958 ODTÜ öğrencisine uygulanmasıyla veri toplanmıştır. Aynı ölçüm aracı 688 Eğitim Fakültesi öğrencisine de araştırmacı tarafından sınıf ortamında uygulanmıştır. Sonuçlar, üniversite öğrencilerinin sürdürülebilir kalkınmanın farklı boyutları üzerine bilgi eksiklikleri olduğunu

göstermiştir. Ek olarak, kişisel davranış değişikliklerine bakıldığında, katılımcıların tercih ettikleri yaşam biçimlerinin sürdürülebilir yaşam ile gerektiği gibi örtüşmediği tespit edilmiştir. Fakat, katılımcılar sürdürülebilir kalkınmaya yönelik olumlu tutumlara ve çevreye yönelik içsel değerlere sahiptirler. Analiz sonuçları medyadaki yayınları takip eden bayan üniversite öğrencilerinin sürdürülebilir kalkınmaya yönelik daha olumlu tutumlara, sürdürülebilir yaşam biçimini destekleyen davranışlara ve içsel çevresel değerlere sahip olduklarını göstermiştir. Aynı zamanda, tutumlar ve değerlerin üniversite öğrencilerinin sürdürülebilir yaşam biçimini destekleyen davranışlarının önemli belirleyicileri oldukları bulunmuştur. İlginç bir şekilde, Eğitim Fakültesi öğrencilerinin tutumları sürdürülebilir yaşam biçimini destekleyen davranışlarıyla anlamlı bir şekilde ilişkili değildir.

Anahtar Kelimeler: Sürdürülebilir Kalkınma için Eğitim, Sürdürülebilir Kalkınmaya yönelik Tutum, Çevresel Değerler, Sürdürülebilir Yaşam Biçimlerine yönelik Davranışlar, Cinsiyet

To My Father

Mustafa Gürcan ALP

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INTRODUCTION

Until the recent movement in environmentalism, when environmental managers came across with any environmental deterioration, they worked out how to overcome the damage or wastage. However, it is more challenging to struggle with these problems when the treats start to show their effects and it becomes compulsory to reverse the impacts. For this reason, environmentalists were compelled to adopt some strategies in order to prevent damage being done in the first place. The necessity to hinder the environmental deterioration reveals sustainability issues. Environmental sustainability is considered as the ability to maintain the qualities that are valued in the physical environment for the sake of the future well being of humanity and the planet (Sutton, 2004). In this aspect, environmentally sustainable actions require the use of renewable rather than depletable resources, to redesign the production process in a way that eliminates the production of toxic materials, to ensure the livability and beauty of nature while increasing the quality of life for all people, and to reduce unfair and excess use of natural resources.

The concept of sustainability was first introduced by a Western environmentalist in the World Council of Churches in 1974 (World Council of Churches, 1974). It was emerged as a result of feelings of concern toward the environment when human beings in many parts of the world suffer from extreme poverty, lack of fresh water, or discrimination.

Sustainability accompanied by sustainable development became a central issue when the United Nations' World Commission on Environment and Development published its report called Our Common Future (World Commission on Environment and Development, 1987). The key point behind this report which was originated from competitive demands for environmental protection and economic development was actually a new approach: sustainable

development. It was reported that sustainable development was dealing with both equity between generations and equity within generations.

Governments, non-governmental organizations, and international agencies quickly got used to the term *"sustainable development"*. Since United Nations Conference on Environment and Development (UNCED) which took place in Rio de Janeiro in 1992, the terms "sustainability" and "sustainable development" has been used interchangeably (UNCED, 1992). In this aspect, these terms were placed in the present study with respect to linguistic positions.

To understand what is meant by "sustainability" every individual has to know why our world is truly unsustainable and what the indicators are which show that our world is unsustainable. The roots of unsustainability rely on very early years and unsustainability has diverse affects on different aspects of our life. Thus, the need for active engagement of every individual towards sustainability is very urgent.

There are some world trends, which show how the stress on the physical and biological systems is increasing. For instance, the world's population has more than doubled since 1950 and increased over 6.2 billion in 2002 (Webster, 2004). The population growth in the mid-1960s peaked above 2 percent, yet the rate declined to 1.18 percent in 2002. Worldwide fish catch statistics illustrated that there is a drastic increase in fish catch per year since 1950 which might cause extinction in some species (Pauly et al., 2002). The distance driven and carbon emitted by automobiles between the years of 1970 and 2000 has mounted up. In line with the increase in the distance driven, the carbon emission has doubled threatening human health.

However, Webster (2004) suggested that unsustainability can not be considered just about environment or nature; it also deals with social conditions, politics, and the economy as well. Increasing wealth has been accompanied by increasing inequality, both within nations and regions and in the world as a whole. As a result many serious health and welfare issues has become among the current issues in the worldwide. In richer nations wealth has been accompanied

by increasng crime, drug and alcohol abuse, mental health problems, and the diseases of affluence such as cancer and heart disease.

To overcome the problems emerging with unsustainability, education and educational cooperation has been viewed as an important factor. A worldwide action plan, namely Agenda 21 accepted at the Earth Summit in 1992 proposed that education is critical for promoting sustainable development and improving the capacity of the people to address sustainable development issues (UNCED, 1992). A later document, the World Summit on Sustainable Development in Johannesburg also points out the importance of education to meet the basic needs of all including the future generations (WSSD, 2002).

These declarations highlighting the crucial role of education as a key element for sustainable development also recommended reorientation of education towards the requirements of sustainable development. In addition, Agenda 21 encourages economic and social development ensuring environmental protection by all levels of formal and non-formal education integrating related issues into all disciplines. Agenda 21 advocates the necessity of interdisciplinary courses which contributes building sustainable societies with professional graduates (UNCED, 1992).

Following the recommendations stated in Agenda 21, "Copernicus Campus" is an education agenda that covers the guidelines for sustainable development in the European Higher Education Area with the support of European Commission (EC, 2005). This document addressed that higher education sector fulfills a central position in ensuring a future society that can cope with the complexities of globalization. According to "Copernicus Campus", European universities have to use innovative strategies and teaching pedagogies in order to develop students' positive attitudes toward cultural and biological diversity, and their understanding on a better life in a safer world in the context of sustainable development.

There are totally 328 universities from 38 different European countries including Turkey that have signed "Copernicus Campus" requirements. The universities which have endorsed the Copernicus Charter should attain some

strategic goals addressed in this document. Firstly, these universities should emphasize sustainable development in their curricula, institutional management and services to the local or regional society. Secondly, all departments in these universities will have shown a progress in self-assessment of incorporation sustainable development into all teaching and research as well as into degree requirements and research projects by 2009. Furthermore, by 2009 these universities will have proceeded in self-assessment of their programs related to their working environment and incorporation goals of sustainable development into this program. Thirdly, by 2010 every university will have formed a partnership on sustainable development cooperation with at least one other university. These universities are expected to help each other in scientific research studies and reorienting their teaching programs as learning by comparing, addressing their needs and how other universities are tackling with challenges. Lastly, by 2012 the pre-conditions required for sustainable development will have been infused into the strategically planned programs in a university-wide process. In this context, these academicians who are aware of the current livability of the planet accelerate the movement to prevent ecological collapse by educating the future leaders (Tuncer, Tekkaya and Sungur, 2006).

Some countries such as Finland and United Kingdom (UK) have proceeded in development of a national strategy of education for sustainable development towards "Copernicus Campus" requirements. In the context of Finland, the initiatives are based on both national strategies and guidelines as well as on regional plans related to the promotion of sustainable development. In the higher education sector of United Kingdom, the Higher Education Funding Council for England (HEFCE) developed their national strategies and declared that the higher education sector would play crucial roles in achievement of sustainability by its support to society – through the skills and knowledge that its graduates learn and put into practice (HEFCE, 2005). In line with the UK national strategies, some higher education institutions (eg. the Center for Sustainable Futures in University of Plymouth) were established to make a contribution to the progress of education for sustainable development regionally,

nationally and internationally (Dyer and Selby, 2004). To achieve the goal of transformation through education for sustainable development, Kagawa (2007) has pointed out that Center for Sustainable Futures as a higher education institution consider different aspects of university life to enhance students' understandings, skills, and activities through sustainable development. Firstly, reorientation of curriculum content by infusing sustainability issues and innovative pedagogies facilitates attainment of sustainability principles and goals. Secondly, creating a campus life which enables student active participation through sustainability projects and encourages student participation in decision-making process stimulates students' behaviors toward sustainable life styles. Thirdly, the authorities in higher education sector should build partnerships with local or global communities and organizations to infuse sustainability into personal and professional life styles. Lastly, culture could be engaged with other aspects of university life in attainment of this goal.

On the other hand, the developing countries including Turkey are at the primitive stage in fulfillment of "Copernicus Campus" requirements covering the integration of related sustainability issues into all disciplines. There are totally 11 public universities in Turkey which endorsed "Copernicus Charter" (EC, 2007), and should have developed their own plans and taken the necessary actions to promote sustainable development through these requirements. In this aspect, the present study sheds light to public universities of developing countries at the adaptation and implementation process of education for sustainable development.

In order to integrate the principles of sustainable development into higher education sector, the present study aimed to address how university students perceive sustainability and what they know about sustainability. The literature review in the field of education for sustainable development have also pointed out that there is a lack of research in university students' understandings of sustainable development and/or sustainability. Thus, the current study fills an important gap at the primitive stage in creating green curriculums towards sustainable development. However, this attempt is surely not sufficient when the

complexities and obstacles faced in designing curriculums towards sustainable development are considered.

Education for sustainable development has been portrayed as an agent that enables people to develop the knowledge, values, and skills in order to engage in activities that will improve the quality of life now and without damaging the planet for the future (Council for Environmental Education, 1998). This conceptualization of education for sustainable development encourages the researchers and educators to act upon the values, attitudes and behaviors of individuals towards sustainable life styles. Furthermore, to achieve the great transition which will ensure reducing hunger and poverty as well as meeting basic human needs while maintaining the life support systems of the planet it is crucially needed to change human values, attitudes, and behaviors (Leiserowitz, Kates and Parris, 2006). Some researchers (Tosunoglu, 1993; Stapp and Polunin, 1991) indicated that everyday decisions from purchasing food produced locally to using energy saving bulbs plays important roles in shaping the future of the planet. Stapp and Polunin (1991) advocated that local actions and personal decisions can and often do have vital ramifications on the quality of the environment. Furthermore, these authors added that developing a world view based on this fact stimulates individuals to establish their own futures and help them to bring about solutions to current and potential problems threatening the quality of life. In this context, it is important to understand the nature of behaviors toward sustainable life styles when creating green curriculums towards sustainable development.

In the light of this literature review, the present study could be also regarded as an attempt to clarify the complex nature of university students' behaviors toward sustainable life styles and to examine a number of variables associated with these behaviors based on the environmental psychology. The present study concerned with university students' sex and their tendency to follow media as the predictor variables of attitudes, values, and actions already taken toward more sustainable life styles. An important part of informal education sector, namely mass media has been addressed as an impersonal force

that drives the long term changes in individuals' attitudes, values, and behaviors toward sustainable life styles (Leiserowitz, Kates and Parris, 2005). In this aspect, the role of Turkish mass media in shaping the future of a society towards sustainability could be addressed in the current study. Regarding the determinants of sustainability-related variables, some national studies conducted in the context of United Kingdom (e.g Barr, 2003; Forum for the Future, 2006) also indicated that socio-demographic variables have been linked to attitudes, values, and behaviors. For instance, The Future Leaders Survey (Forum for the Future, 2006) highlighted that men and women had stark differences in attitudes and behaviors toward more sustainable life styles. This report stated that women were more likely to hold feelings of concern towards survival of humanity, willingness to change their life styles radically, and readily take the necessary actions. In the context of Turkey, however, the literature review could provide limited number of research studies addressing the link between sex and sustainability-related variables.

To conclude, the present study shed light to the major concerns in creating a green curriculum towards sustainability while examining university students' understandings of sustainable development and the complex nature of their behaviors.

1.1 The Main Problems

In line with these new worldwide trends through education for sustainable development in higher education sector, the present study centered on two main study groups; students at METU and students from Faculty of Education at METU. However, the primary purpose was to develop a valid and reliable questionnaire that could be used to assess university students' perceptions of sustainability-related concerns.

Regarding the students at METU, the current study aimed (1.1) to determine these students' familiarity and current understandings of sustainable development, and their views on sustainable usage of natural resources at the campus; (1.2) to explore their attitudes toward sustainable development and its

different aspects (economic, environmental, social), their behaviors toward sustainable life styles, and environmental values; (1.3) to examine their perceptions of their own and society's future; and (1.4) to investigate the significant predictors of their environmental values, and attitudes and behaviors toward sustainable life styles.

Furthermore, concerning the students from Faculty of Education at METU, the purposes of the present study are (2.1) to explore these students' familiarity and current understandings of sustainable development, and their views on sustainable usage of natural resources at the campus; (2.2) to determine their attitudes toward sustainable development and its different aspects (economic, environmental, social), their behaviors toward sustainable life styles, and environmental values; (2.3) to examine their perceptions of their own and society's future; and (2.4) to investigate the significant predictors of their environmental values, and attitudes and behaviors toward sustainable life styles.

The proposed model for the sustainability related variables is presented in Figure 1.1.

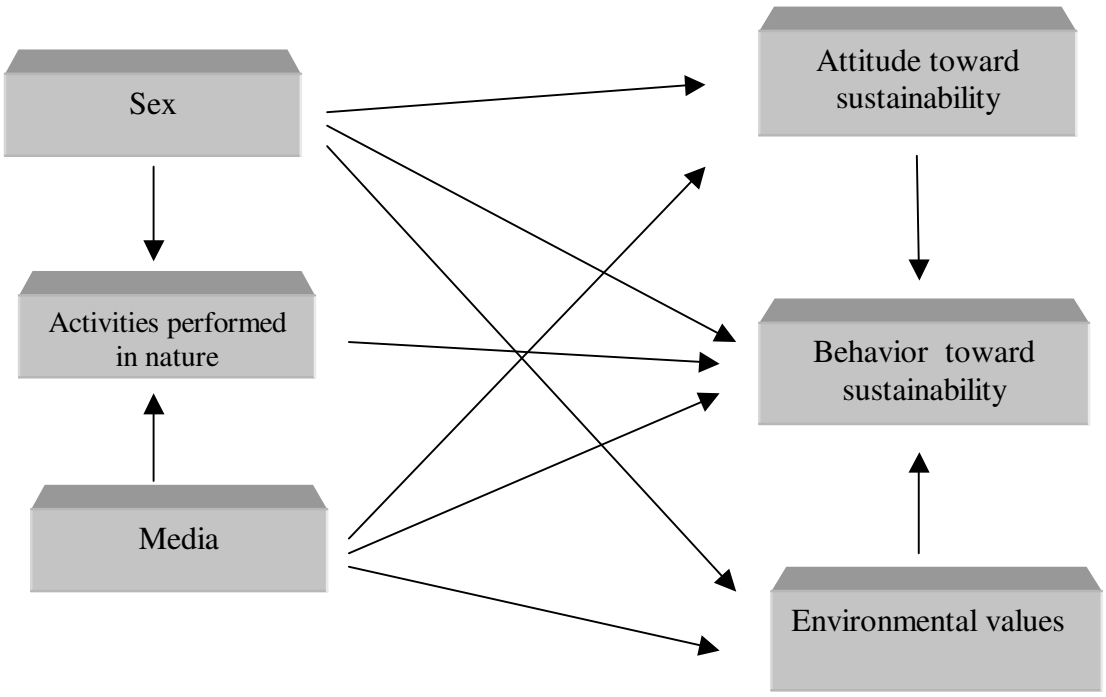

Figure 1.1 Proposed Model for the Sustainability Related Variables

1.2 The Sub-problems

The sub-problems related to main problem (1.1) are:

1. How familiar are METU students with the term "sustainable development?
2. What are METU students' understandings of sustainable development?
3. What are METU students' views on sustainable usage of natural resources at the campus?

The sub-problems related to main problem (1.2) are:

4. What are METU students' attitudes toward sustainable development and its different aspects (economic, environmental, social)?
5. What are METU students' behaviors toward sustainable life styles?
6. What are METU students' environmental values?

The sub-problems related to main problem (1.3) are:

7. What are METU students' views on future of society?
8. What are METU students' future expectations on their own life?
9. What are sustainability goals of Turkish society proposed by METU students?

The sub-problems related to main problem (1.4) are:

10. Is the path coefficient from METU students' activities performed in nature to behaviors toward sustainable life styles significant?
11. Is the path coefficient from METU students' environmental values to behaviors toward sustainable life styles significant?
12. Is the path coefficient from METU students' attitudes toward sustainable development to behaviors toward sustainable life styles significant?
13. Is the path coefficient from sex to METU students' behaviors toward sustainable life styles significant?

14. Is the path coefficient from media to METU students' behaviors toward sustainable life styles significant?
15. Is the path coefficient from sex to METU students' attitudes toward sustainable development significant?
16. Is the path coefficient from media to METU students' attitudes toward sustainable development significant?
17. Is the path coefficient from sex to METU students' environmental values significant?
18. Is the path coefficient from media to METU students' environmental values significant?
19. Is the path coefficient from sex to METU students' activities performed in nature?
20. Is the path coefficient from media to METU students' activities performed in nature?

The sub-problems related to main problem (2.1) are:

21. How familiar are pre-service teachers at METU with the term "sustainable development?
22. What are Faculty of Education students' understandings of sustainable development?
23. What are Faculty of Education students' views on sustainable usage of natural resources at the campus?

The sub-problems related to main problem (2.2) are:

24. What are Faculty of Education students' attitudes toward sustainable development and its different aspects (economic, environmental, social)?
25. What are Faculty of Education students' behaviors toward sustainable life styles?
26. What are Faculty of Education students' environmental values?

The sub-problems related to main problem (2.3) are:

27. What are Faculty of Education students' views on future of society?
28. What are Faculty of Education students' future expectations on their own life?
29. What are sustainability goals of Turkish society proposed by Faculty of Education students?

The sub-problems related to main problem (2.4) are:

30. Is the path coefficient from Faculty of Education students' activities performed in nature to behaviors toward sustainable life styles significant?
31. Is the path coefficient from Faculty of Education students' environmental values to behaviors toward sustainable life styles significant?
32. Is the path coefficient from Faculty of Education students' attitudes toward sustainable development to behaviors toward sustainable life styles significant?
33. Is the path coefficient from sex to Faculty of Education students' behaviors toward sustainable life styles significant?
34. Is the path coefficient from activities performed in nature to Faculty of Education students' behaviors toward sustainable life styles significant?
35. Is the path coefficient from media to Faculty of Education students' behaviors toward sustainable life styles significant?
36. Is the path coefficient from sex to Faculty of Education students' attitudes toward sustainable development significant?
37. Is the path coefficient from media to Faculty of Education students' attitudes toward sustainable development significant?
38. Is the path coefficient from sex to Faculty of Education students' environmental values significant?

39. Is the path coefficient from media to Faculty of Education students' environmental values significant?
40. Is the path coefficient from sex to Faculty of Education students' activities performed in nature?
41. Is the path coefficient from media to Faculty of Education students' activities performed in nature?

1.3 Null Hypotheses

The problems stated above are tested with the following hypotheses.

Null Hypothesis 1

The path coefficient from METU students' activities performed in nature to behaviors toward sustainable life styles is not significant.

Null Hypothesis 2

The path coefficient from METU students' environmental values to behaviors toward sustainable life styles is not significant.

Null Hypothesis 3

The path coefficient from METU students' attitudes toward sustainable development to behaviors toward sustainable life styles is not significant.

Null Hypothesis 4

The path coefficient from sex to METU students' behaviors toward sustainable life styles is not significant.

Null Hypothesis 5

The path coefficient from media to METU students' behaviors toward sustainable life styles is not significant.

Null Hypothesis 6

The path coefficient from sex to METU students' attitudes toward sustainable development is not significant.

Null Hypothesis 7

The path coefficient from media to METU students' attitudes toward sustainable development is not significant.

Null Hypothesis 8

The path coefficient from sex to METU students' environmental values is not significant.

Null Hypothesis 9

The path coefficient from media to METU students' environmental values is not significant.

Null Hypothesis 10

The path coefficient from sex to METU students' activities performed in nature is not significant.

Null Hypothesis 11

The path coefficient from media to METU students' activities performed in nature is not significant.

Null Hypothesis 12

The path coefficient from Faculty of Education students' activities performed in nature to behaviors toward sustainable life styles is not significant.

Null Hypothesis 13

The path coefficient from Faculty of Education students' environmental values to behaviors toward sustainable life styles is not significant.

Null Hypothesis 14

The path coefficient from Faculty of Education students' attitudes toward sustainable development to behaviors toward sustainable life styles is not significant.

Null Hypothesis 15

The path coefficient from sex to Faculty of Education students' behaviors toward sustainable life styles is not significant.

Null Hypothesis 16

The path coefficient from media to Faculty of Education students' behaviors toward sustainable life styles is not significant.

Null Hypothesis 17

The path coefficient from sex to Faculty of Education students' attitudes toward sustainable development is not significant.

Null Hypothesis 18

The path coefficient from media to Faculty of Education students' attitudes toward sustainable development is not significant.

Null Hypothesis 19

The path coefficient from sex to Faculty of Education students' environmental values is not significant.

Null Hypothesis 20

The path coefficient from media to Faculty of Education students' environmental values is not significant.

Null Hypothesis 21

The path coefficient from sex to Faculty of Education students' activities performed in nature is not significant.

Null Hypothesis 22

The path coefficient from media to Faculty of Education students' activities performed in nature is not significant.

1.4 Definition of Important Terms

This section includes some important definitions related to present study.

Sustainable Development: It is *"the development that meets the needs of the present without compromising the ability of future generations to meet their needs"* (World Commission on Environment and Development, 1987, p.43).

Value: It is *"a sense of what is particularly important, good or valuable to us"* (Gross, 2005, p. 350; Rokeach, 1976, p. 112). Alternatively, it can be defined as "*the basic criteria people used to select and justify actions and to evaluate people (including the self) and events"* Schwartz (1992, p.1).

Attitude: It is typically defined as *"a predisposition to respond or behave in a particular manner"* (Gross, 2005, p. 350; Oskamp, 1991, p. 3).

Behavior: It refers to *"concrete decisions and actions taken by individuals and groups, which are often rooted in underlying values and attitudes"* (Leiserowitz, Kates and Parris, 2006, p. 414).

1.5 Significance of the Study

Higher education has been advocated to make a major contribution to the process of sustainable development (Haigh, 2005). Incorporating multi-facet nature of sustainable development into higher education emerged with the Stockholm Declaration in 1972 and this declaration has facilitated higher education sector to recognize the importance of infusing education for sustainable development into their curricula (Thomas and Nikita, 2002). Furthermore, Talloires Declaration (UNESCO, 1990) which was proposed at an international conference in Talloires, France, shows the official agreement of university administrators to commit requirements of education for sustainable development in higher education. Accordingly, more than 250 institutions from 43 countries has signed University Leaders for a Sustainable Future (*www.ULSF.org*).

Recently, an international document on stimulation of sustainable development (EC, 2005) has also proposed that higher education can shape the future of society as democratic, stable and peaceful. This document has outlined the declaration of University of Graz and University of Technology of Graz on committing higher education to the process of sustainable development. As supported by this outline, universities, the location of academic education will ensure to educate future leaders of the society with appropriate professions and moral qualities. As major contributors to research, universities have a potential to overcome the complexities in transition of societies towards more sustainable life styles. As important societal facilitators, universities reform their local, regional, and national environments, and undertake the major responsibility to shape a sustainable future. These challenges and opportunities require universities endorsed Copernicus Charter to address their current position on the way to meet the requirements of sustainable development.

The Copernicus guidelines might assist higher education institutions by providing some simple steps to meet the challenges of incorporation principles of sustainable development into higher education system (EC, 2005). These steps which aimed to get the implementation of strategic goals started begin with doing a gap analysis on the elements of sustainability already in the curriculum,

campus, community, and culture. In this aspect, the present study provides a valid and reliable measuring tool to perform the gap analysis in the higher education institutions of developing countries. Furthermore, the current study highlights the potential concerns which could be faced with on the integration process of sustainable development into higher education institutions.

As mentioned below, the present study has a focus point on doing a gap analysis in order to empower the higher education graduates for their personal roles in a more sustainable society. However, the universities endorsed Copernicus Charter should also provide the highly skilled individuals necessary for every labor market such as teachers, engineers, architects, scientists, and many more. These professionals should be well equipped with the capacity and analytical skills that drive local economies, support civil society, create sustainable settlements, educate the next generations, and make important decisions which affect entire societies. In this aspect, the present study has taken on another mission to determine the potential deficiencies or powerful aspects of students at Faculty of Education. Since, the graduates of Faculty of Education have a crucially important responsibility in preparing pupils to become active citizens toward a better and self-sustainable world (Summers, Corney and Childs, 2004). Recognizing social characteristics of Turkey as being a developing country and holding a large population of young people it is very important to enable young people to develop knowledge, values, and skills while creating a sustainable future. At this point it should be noted that education for sustainable development has been arriving into all levels of education including early childhood, elementary and high school education as well as higher education (Webster, 2004). In this context, education for sustainable development in the teacher education programs could not discard to prepare future teachers to effectively teach about sustainability related issues. Since young people are educated through the guidance of teachers, future teachers should be well equipped with the necessary skills and understanding in order to overcome the obstacles toward a sustainable world (Alkis and Ozturk, 2007).

As supported by Moore (2005) who finalized her study about British Columbia's engagement with sustainability, by creating new models of collaborative and interdisciplinary curricula, student teachers can learn how to act as a facilitator in developing new structures that change sustainability transition from current rhetoric to reality. However, there has been quite little recognition and literature available on education for sustainable development in the context of teacher education programs in Turkey. At this point it becomes a necessity to possess some information on future implementers' readiness and potential to teach effectively in this domain.

To sum up, the present study which was conducted in a public university of a developing country, shed light to address the necessary strategies and innovative pedagogies in order to promote sustainable development in higher education sector. In addition, this study provides the background information which could be used in reorientation of Education Faculties toward principles of education for sustainable development.

CHAPTER 2

LITERATURE REVIEW

This chapter is devoted to theoretical background of sustainable development, education for sustainable development, significant predictors of behaviors toward sustainable life styles, and sustainable development in Turkey.

2.1 The New Paradigm of Environmentalism

The state of environmental deterioration forced environmentalists to search for a new paradigm. The United Nations Conference on Human and Environment in Stockholm in 1972 was shown as the beginning point for this search (Barber, 2003). The key issue that leaded to strong discussions was related to different environmental perspectives of anthropocentric ecological end and non-anthropocentric (ecocentric) end (Figure 2.1). Anthropocentric perspective, also stated as technocentric mode, was that unlimited human progress is possible through the exploitation of nature's infinite resources (Merchant, 1980). Some antropocentric environmentalists (Gladwin, Kennelly, and Krause, 1995; Merchant, 1980) supported the view of "we must torture nature's secrets from her". In other words, antropocentric perspective views human being totally separate from and superior to nature. In line with this view, Lewis (1953, p.44) observed, "We reduce things to mere *Nature* in order that we may 'conquer' them. We are always conquering *Nature*, because '*Nature*' is the name for what we have, to some extent, conquered". On contrary, ecocentrism or nature-centered views support the idea that nonhuman nature has intrinsic value apart from its contributions to human development (Devall and Sessions, 1985). In other words, human being is not separate or superior to nature, but has a value and place in nature's system. Furthermore, in line with this view, human development should guarantee the integrity of natural ecosystems (Egri and Pinfield, 1996).

Until recent years, the anthropocentric environmental perspective has been viewed as dominant, and advocators of anthropocentrism encourage environmental managers toward promotion of economic growth in order to reduce poverty and inequality. On the hand, proponents of ecocentrism point out that population explosion, new consumption patterns, and economic growth do not support sustainable lifestyles in that our natural resources are depleted and the balance of ecosystems were deteriorated (O'Riordan, 1989).

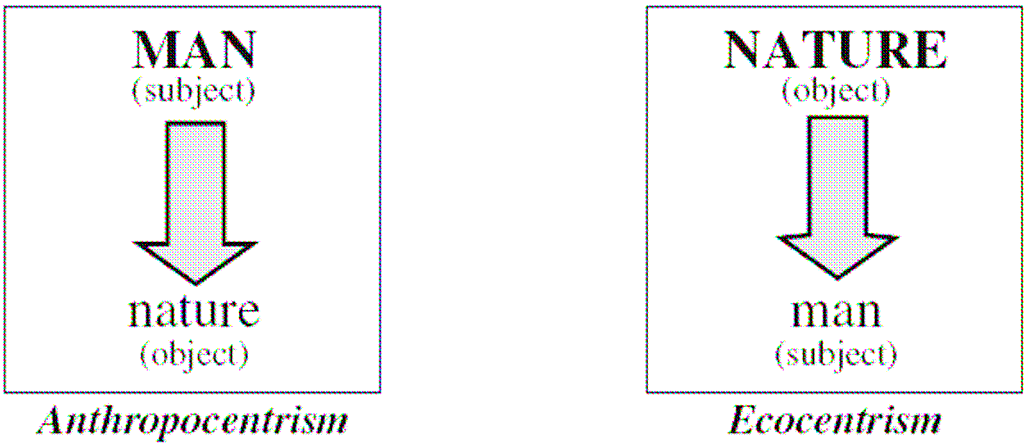

Figure 2.1 Human-Nature Relationship according to Anthropocentric and Ecocentric Views

The two paradigms are reflective of Orr's (1992) two perspectives of sustainability: technological sustainability, which is based on the premise that humankind is dominant over nature and ecological sustainability, which is based on the premises that humankind is part of nature and that there are limits to growth. In this latter paradigm, nature and consideration of carrying capacity should be considered in the design of housing, cities, neighborhoods, technologies and regional economies.

Drengson (1995) advocates a shift from the technocratic to the ecocentric paradigm. Nature is viewed by technocentrics as an object and machine. On the other hand, ecocentric paradigm underlines the interrelatedness of the biosphere. That paradigm does not only recognize human values but also the intrinsic value of all organisms. Additionally, red-green and Dark green

perspectives belong to the ecocentric path. Lying between a light green and dark green environmentalism, the red-green position brings in technocentric view of improved legislation that reflect ecologically sustainable development concerns as means to improve economic conditions and sustain equitable living. From among all these environmental perspectives and paradigms, sustainable development is the most significant strategy that attempts to redefine the relationship between human and the environment (World Commission on Environment and Development, 1987). Sustainable development is an environmental position that seeks to balance between both social and environmental development.

2.2 The Concept of Sustainable Development

Before clarifying the term "sustainable development", it might be prominent to examine how this term has emerged. For the last half of the twentieth century, four key elements, which are peace, freedom, development, and environment, has been concerned as the main goals of the people living all over the world (National Research Council, Policy Division, Board on Sustainable Development, 1999). It was thought that wars were ended up after the world war of 1945, but nuclear weapons and wars started to threaten people's and future generation's life at this point. It is a fact that the number of wars has decreased over the last decade whereas peace is still the key aspiration of the Africans and the Middle Eastern people (Marshall and Gurr, 2003).

Kates, Parris and Leiserowitz (2005) have argued that imperialism and totalitarian oppression are among the barriers for freedom. On the other hand, ensuring democracy in governmental institutions and nongovernmental organizations, human rights, and the rights of women, children and minorities play a crucial role that support freedom. Also, these researchers (2005) have pointed out that while some of the colonies attained their national independence, economic development was interpreted as the basic necessity for the poorest ones and high standards of living for the wealthier nations. For the past approximately

40 years, the environment has emerged as a new aspiration of national and international organizations, institutions, and laws.

Beginning from 1970's and 1980's, worldwide commissions started to focus on four key themes; peace, freedom, development, and environment, in their studies, because these are the major factors that support satisfaction of people. The common point behind these international commissions was encouragement to link together the aspirations of human beings (Kates, Parris and Leiserowitz, 2005). Sustainable development has emerged as a result of such efforts which specifically focus on development and environment.

The term sustainable development is gradually changing over time which causes an obstacle in clarifying the term. "Sustainable development" was primarily stated in the document World Conservation Strategy (International Union for the Conservation of Nature and Natural Resources, 1980) that demonstrated conservation as a way to attain development and serve especially for the goals of sustainable development, and wise usage of natural resources and ecosystems. "Sustainable development" has become a widely known concept since the World Commission on Environment and Development (WCED) reported about sustainability in 1987. This world commission was initiated by the General Assembly of the United Nations and its report was titled with *Our Common Future*. The Prime Minister of Norway, who was Gro Harlem Brundtland, was the chair person of the commission so named as 'Brundtland Commission'. As Brundtland stated:

"The environment does not exist as a sphere separate from human actions, ambitions, and needs and attempts to defend it in isolation from human concerns have given the very word 'environment' a connotation of naivety in some political circles. The word 'development' has also been narrowed by some into a very limited focus, along the lines of 'what poor nations should do to become richer', and thus again is automatically dismissed by many in the international arena as being a concern of specialists, of those involved in questions of 'development assistance'. But the 'environment' is where we live;

and the 'development' is what we all do in attempting to improve our lot within that abode. The two are inseparable."

The definition WCED suggested: "*Sustainable development is development which meets the needs of the present without comprising the ability of future generations to meet their own needs"* (WCED, 1987, p. 43). The brief definition of sustainable development by WCED implies that human needs are basic and essential. Furthermore, economic development accompanied by equity to share resources with poor nations should be maintained and the equity should be encouraged by effective citizen participation.

Until the recent years, the literature review (e.g Kates, Parris and Leiserowitz, 2005) has pointed out the unclear points of the standard definition of sustainable development. To satisfy the needs of many governments and individuals in clarifying the definition of the term sustainable development, The Rio Declaration on Environment and Development (United Nations Conference on Environment and Development [UNCED], 1992) listed 18 principles of sustainability as:

- *People are entitled to a healthy and productive life in harmony with nature.*
- *Development today must not undermine the developmental and environmental needs of present and future generations.*
- *Nations have the sovereign right to exploit their own resources, but without causing environmental damage beyond their borders.*
- *Nations shall develop international laws to provide compensation for damage that activities under their control cause to areas beyond their borders.*
- *Nations shall use the precautionary approach to protect the environment. Where there are threats of serious or irreversible damage, scientific uncertainty shall not be used to postpone cost-effective measures to prevent environmental degradation.*
- *In order to achieve sustainable development, environmental protection shall constitute an integral part of the development process, and cannot be considered in isolation from it.*

- *Eradicating poverty and reducing disparities in living standards in different parts of the world are essential to achieve sustainable development and meet the needs of the majority of people.*
- *Nations shall cooperate to conserve, protect and restore the health and integrity of the Earth's ecosystem. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.*
- *Nations should reduce and eliminate unsustainable patterns of production and consumption, and promote appropriate demographic policies.*
- *Environmental issues are best handled with the participation of all concerned citizens. States shall facilitate and encourage public awareness and participation by making environmental information widely available.*
- *Nations shall enact effective environmental laws, and develop national law regarding liability for the victims of pollution and other environmental damage. Where they have authority, nations shall assess the environmental impact of proposed activities that are likely to have a significant adverse impact.*
- *Nations should cooperate to promote an open international economic system that will lead to economic growth and sustainable development in all countries. Environmental policies should not be used as an unjustifiable means of restricting international trade.*
- *The polluter should, in principle, bear the cost of pollution.*
- *Nations shall warn one another of natural disasters or activities that may have harmful transboundary impacts.*
- *Sustainable development requires better scientific understanding of the problems. Nations should share knowledge and innovative technologies to achieve the goal of sustainability.*
- *The full participation of women is essential to achieve sustainable development. The creativity, ideals and courage of youth and the knowledge*

of indigenous people are needed too. Nations should recognize and support the identity, culture and interests of indigenous people.

- *Warfare is inherently destructive of sustainable development, and Nations shall respect international laws protecting environment in times of armed conflict, and shall cooperate in their further establishment.*
- *Peace, development and environmental protection are interdependent and indivisible.*

These principles stated in the Rio Declaration (UNCED, 1992) provide determinants for a composition of locally relevant and culturally appropriate sustainable development for every community, region, and nationality (McKeown, 2002). In addition to this attempt to clarify the definition of sustainable development, a report titled with *"Our Common Journey: A Transition toward Sustainability"* by the Board on Sustainable Development (National Research Council, Policy Division, Board on Sustainable Development, 1999) made a contribution in this field by summarizing what is to be sustained, what is to be developed, the relationship between these concerns, and the time horizon of the future under the umbrella of sustainable development as it was outlined in Table 2.1. For each heading, "what is to be sustained" and "what is to be developed", three major categories were presented as well as the sub-categories. The board indicated that the sustainable development literature most commonly focused on life support systems, which viewed nature and environment as a source of services for the utility of humankind life. However, nature actually has an intrinsic value as well as its utility for life of human beings. Cultural diversity, and groups and places from distinctive and threatened communities are among the concerns that should be sustained.

The Board on Sustainable Development pointed out the different ideas such as people, economy, and society that should be developed. Kates, Parris and Leiserowitz (2005) argued that the research studies had frequently focused on economic development, consumption patterns, and strategies to increase the wealth. These authors, however, added that the main focus shifted from economic

development to human and society development inferring an emphasis on attitudes, values, human rights, and sustainability goals such as equal expectancy, education, and equity.

Table 2.1 Description of Sustainable Development in Our Common Journey: A Transition toward Sustainability

WHAT IS TO BE SUSTAINED	FOR HOW LONG?	WHAT IS TO BE DEVELOPED
	25 years "now and in the future" Forever	
NATURE Earth Biodiversity Ecosystems		**PEOPLE** Child survival Life expectancy Education Equity Equal opportunity
LIFE SUPPORT Ecosystem services Resources Environment	**LINKED BY** Only Mostly But And Or	**ECONOMY** Wealth Productive sectors Consumption
COMMUNITY Cultures Groups Places		SOCIETY Institutions Social capital States Regions

Although the term sustainable development is commonly used by politicians, economists, and scientists as well as educators, the interpretation of the term differs also with respect to these interest groups. The experts who believe the dominant characteristics of economic priorities and outcomes criticize the sustainability from a different perspective. Eliot (1998) proposed that development appears to be consistent with economic growth, but contrasts with the preservation of natural resources. Sauvé (1996) emphasized that sustainable development requires enhancement of social values to create sustainable communities, which are not supported with free market and technological development.

While the debate on different interpretations of sustainable development has not been stopped, as supported by the 2002 World Summit on Sustainable Development the common idea on this concept can be viewed in terms of three dimensions: environment, economy and society (Figure 2.2).

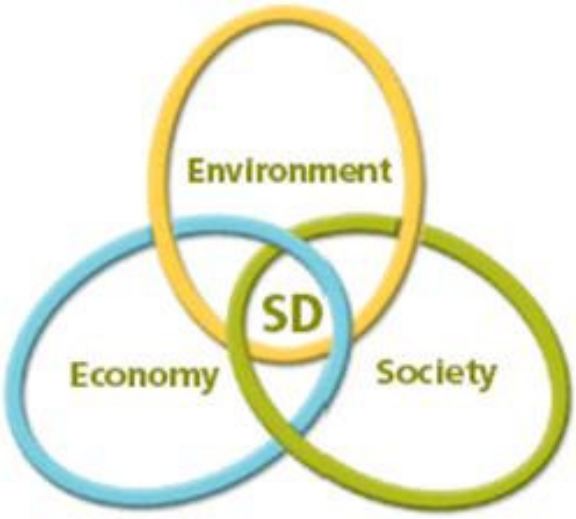

Figure 2.2 Conceptualization of Sustainable Development

In 2002, Gough emphasized the interaction of environment with economy and society. He proposed that nobody can develop an understanding of the environment with disregarding the social and economic interactions with it.

For instance, healthy future generations in welfare count on a healthy environment to provide clean air, natural resources, healthy foods, and safe drinking water for every individual regardless of any sort of discrimination. In parallel with Gough, Luke (2001) was opposed to making sharp distinctions between environment and economy/society/community. The idea of bringing together the environmental, economic and social (including educational and political) spheres emerged as a collective decision held by experts from different range of interest groups, whereas the debates on the concept of sustainable development is still going on.

In recent years, the discussion about sustainability and education for sustainable development has shifted from a search for a universal consensus to a position where there is an acceptance of varying definitions and approaches (Scott and Oulton, 1999). Furthermore, Sauvé (1996) supported this view with emphasizing the role of different paths resulting with the desired outcome which can also serve for the concept of sustainable development. According to Scott and Gough (2003), lifelong learning is the key element in sustainable development and it can be a process – not an end state. Sustainability can be thought as a paradigm for the sake of a future in which environmental, social and economic aspects are balanced in order to endeavor for improved quality of life. During this process, interaction with people from different point of view seems to work well in learning more about sustainability.

2.2.1 Sustainability Goals

The major goals of sustainable development, or in other words, what it seeks to attain was proposed to be another way in order to clarify the ambiguity of sustainable development (Kates, Parris and Leiserowitz, 2005). The literature review illustrated three sets of goals declared with respect to different time-horizons: millennium goals stated by the United Nations (short term; 2015), goals of the sustainability transition declared by the Board on Sustainable Development (2050), and goals of the Great Transition proposed by the Global Scenario Group (long term; beyond 2050).

The Millennium Development Goals (MDGs) were put forward by United Nations General Assembly and reported as United Nations Millennium Declaration in the year of 2000. The declaration covers eight international development goals which 189 United Nations member states and some international organizations have declared to achieve by the year 2015. The Millennium Development Goals act upon sustainable development as a new framework by setting social equity goals and targets that facilitates economic development while ensuring environmental sustainability (United Nations General Assembly, 2000). Millennium Development Goals including 21 targets can be listed as the following:

1. Eradicate extreme poverty and hunger (halving the proportion of people whose income is less than one dollar a day; achieving full and productive employment and decent work for everybody including women and young people, halving the proportion of people who suffer from hunger)

2. Achieve universal primary education (ensuring that children everywhere, boys and girls alike, will be able to complete a full course of primary school education)

3. Promote gender equality and empower women (eliminating gender disparity in primary and secondary education by 2005, and at all levels of school education by 2015)

4. Reduce child mortality (Reducing by two-thirds the under-five mortality rate)

5. Improve maternal health (Reducing by three quarters the maternal mortality ratio, achieving universal access to reproductive health)

6. Combat HIV/AIDS, malaria, and other diseases (halting and reversing the spread of HIV/AIDS, malaria, and major diseases; achieving universal access to treatment for HIV/AIDS for all those who need it)

7. Ensure environmental sustainability (Infusing the principles of sustainable development into country policies and programs; reversing loss of environmental resources; reducing biodiversity loss; halving the proportion of people without

sustainable access to safe drinking water and basic sanitation; achieving a significant improvement in the lives of at least 100 million slum-dwellers)

8. Develop a global partnership for development (Developing an open trading and financial system which is rule-based, predictable and non-discriminatory; addressing the special needs of the least developed countries; addressing the special needs of landlocked and small island developing states; dealing with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term; providing access to affordable essential drugs in developing countries in cooperation with pharmaceutical companies; making available the benefits of new technologies in cooperation with the private sector)

The United Nations Millennium Declaration (United Nations General Assembly, 2000) reflected that these goals might be achieved by transition of some shared values related to peace, human development, environment, hunger, and poverty into some specific actions. This set of values which was stressed in the declaration was tabulated as it was presented in Table 2.2.

Table 2.2 Values to Attain The Millennium Development Goals

1. **Freedom:** Men and women have equal rights to live and raise their children in dignity, free from hunger and from the fear of violence, oppression or injustice. Democratic and participatory governance based on the will of the people best assures these rights.
2. **Equality:** No individual and no nation must be denied the opportunity to benefit from development. The equal rights and opportunities of women and men must be assured.
3. **Solidarity:** Global challenges must be managed in a way that distributes the costs and burdens fairly in accordance with basic principles of equity and social justice. Those who suffer or benefit least deserve help from those who benefit most.

Table 2.2 (cont'd)

4. **Tolerance:** Human beings must respect one or another, in all their diversity of belief, culture and language. Differences within and between societies should be neither feared nor repressed, but cherished as a precious asset of humanity. A culture of peace and dialog among all civilizations should be actively promoted.
5. **Respect for nature:** Prudence must be shown in the management of all living species and natural resources, in accordance with the precepts of sustainable development. Only in this way can be the immeasurable riches provided to us by nature be preserved and passed on to our descendents. The current unsustainable patterns of production and consumption must be changed in the interest of our future welfare and that of our descendants.
6. **Shared Responsibility:** Responsibility for managing worldwide economic and social development, as well as threats to international peace and security must be shared among the nations of the world and should be exercised multilaterally. As the most universal and most representative organization in the world, United Nations must play the central role.

However, the international agencies which were responsible for supervising this process reported that many countries in Africa had troubles in achieving these goals. At the same time, these agencies added that collective action by the world community and national governments seemed to aid in attainment of sustainability goals.

Regarding the two generation time horizon, the Board on Sustainable Development concentrated on the needs of a world population with half as many more people as there are today (National Research Council, Policy Division, Board on Sustainable Development, 1999). The board indicated that although the needs of today's people should have been met, this would be much more complex for the next generations. For this time horizon, the board proposed that in the year of 2050 everyone should be provided by the energy, materials and information to

be nourished, educated, and to take shelter in a house accompanied by the reduced hunger and poverty, and the preserved basic life support systems of the planet.

Considering the years beyond 2050, the Board on Sustainable Development with the cooperation of the Global Scenario Group proposed "Sustainability Transition Scenario" focusing on hunger and global warming (Raskin, 2002). These attempts formed the basis of the Policy Reform Scenario Group and advocated that sustainability transition is not possible with a social revolution or a technological miracle. But, they added that sustainability transition depends on changing life styles, values, or economic systems and this should be supported by political will and governmental commitment. Finally, the Global Scenario Group proposed the Great Transition Scenario covering both the sustainability goals proposed by the Board on Sustainable Development and the goals to achieve for all humankind "a rich quality of life, strong human ties and a resonant connection to nature".

2.3 Education for Sustainable Development

Not only are uncertainties and confusions regarding the concept of sustainable development still going on, but also the notion of education for sustainable development (ESD) is similarly open to debate.

There has been an attempt to make the concept of education for sustainable development evident, which is quite challenging. According to some researchers (e.g. Sauvé, 2002), ESD seems to emerge as a current issue within environmental education. This idea was supported by Fien (1993) and Huckle (1993) who indicated an emphasis on issues of sustainability evolving through the prioritization to the understanding of social, political and economic influences on the environment and enhancement of children's awareness, emotional bonding to nature, and responsible actions. In line with these interpretations, Palmer (1998) stated the appropriateness of ESD within environmental education and presented ESD as a new trend for teaching and learning about the environment.

On contrary to these suggestions, some researchers do not interpret ESD as an evolution within environmental education. This may be due to another point of view which gives priority to physical environment and issues such as human impact, preservation and conservation of the nature through environmental education. According to Sterling (2001), ESD can be recognized as sustainable education in which there is a movement toward the renewal of education system and institutions 'doing better things' and 'seeing things differently'.

Apart from those qualitatively different interpretations of ESD, in 1998 the Council for Environmental Education published a strategy report (CEE, 1998) titled with *Education for sustainable development in the schools sector* in Sustainable Development Education Panel (SDEP) which is particularly significant for teachers. ESD was defined in this report (p.3) in the following way:

> *Education for sustainable development enables people to develop the knowledge, values, and skills to participate in decisions about the way we do things individually and collectively, both globally and locally, that will improve the quality of life now and without damaging the planet for the future.*

Furthermore, this report specified seven key dimensions from the conceptualization of sustainable development, namely: interdependence; citizenship and stewardship; needs and rights of future generations; diversity (cultural, social, economic, and biological); quality of life, equity and justice; sustainable change (development and carrying capacity); and uncertainty and precaution in action.

The report was written by some educators assigned by the government of England and Wales where sustainable development was placed in the revised National Curriculum for the year 2000. It also serves for learning outcomes reflecting each key spheres of ESD. Since there is little exemplification of teaching practices regarding ESD, the researches (Summers and Kruger, 2003; Summers, Corney and Childs, 2003) which focused on English primary school teachers' reflections on each dimensions of sustainable development into

classroom teaching has a great contribution to our knowledge base. After a preparation period for teachers' professional development on ESD, the participants of this program proposed some examples for their teaching practices on dimensions of sustainable development (Table 2.3). These authors inferred from the content and teaching strategies included in teachers' classroom activities that they could interpret ESD in line with CEE framework. Furthermore, they evaluated the teachers' views from the perspective of Sauvé (1996). Sauvé has considered the connection between the fundamental elements of ESD and conceptions of environmental education. The educator emphasized that ESD has evolved as a result of a need to update the environmental education discourse through the consideration of the needs and rights of human beings as an integral part of the ecosystem. Hopefully from this perspective, these teachers' conceptions of ESD strongly depended on the citizenship and stewardship covering the importance of taking responsibility, human action, and making a difference. Furthermore, they viewed sustainable development holistically in terms of social, economic and environmental factors. They aimed to enactive the pupils in both social and economical issues utilizing the perspectives of people from different communities. To make clear conceptualizations of sustainable development in the wider community of primary school teachers, case-study examples covered in CEE report for classroom practice may not be sufficient. For this reason, Summers and Kruger (2003) recommended that appropriate professional development programs may support in interpreting the dimensions of ESD reported in CEE.

Table 2.3 Examples of Teaching Practices for the CEE Report Dimensions

Dimension	*Some examples*
1. Interdependence *people, the environment and the economy are inextricably linked at all levels from local to global*	*• Brazilian rainforests are a source of valuable drugs used in western medicine* *• Global warming from our burning of fossil fuels may contribute to floods in Bangladesh* *• The common blue butterfly needs grassland grazed by sheep to survive*
2. Citizenship and stewardship *the importance of taking individual responsibility and action to ensure the world is a better place*	*• Things can be done to make the school environment better for animals, plants and ourselves, e.g. creating a 'wild' area or planting 'butterfly-friendly' plants* *• Children can co-operate with others to take energy saving measures in school* *• Individuals can make a difference to the problem of waste by using the '4 Rs' (reduce, reuse, repair, recycle)*
3. Needs and rights of future generations *our own basic needs and the implications for the needs of future generations of actions taken today*	*• Utilizing more sustainable and less wasteful energy-related actions and products conserves finite energy sources for use by those who come after us* *• Our children (and their children) have a right to see wild tigers in their natural habitat*
4. Diversity *respecting and valuing both human diversity – cultural, social and economic – and biodiversity*	*• The variety of species of fish and insects in a river is a measure of water purity* *• Nature reserves show the variety of distinctive types of wildlife found in different areas* *• The rainforest environment can sustain an enormous range of plants and animals, many of which have beneficial uses to humanity – what others remain undiscovered?*
5. Quality of life, equity and justice *global equity and justice are essential elements of sustainability and basic needs must be met universally*	*• The issues of inequality and poverty must be addressed if tiger populations are to be sustained* *• A home, water and energy are universal basic needs which are not equally available to all* *• People of more economically developed countries have an ecological footprint greater than the earth share only at the expense of other less fortunate people in less economically developed countries*
6. Sustainable change (development and carrying capacity) *understanding that resources are finite and that this has implications for people's lifestyles, and for commerce and industry*	*• A given area of forest can only support a certain number of tigers – deforestation therefore means fewer tigers can survive* *• Burning fossil fuels releases carbon dioxide into the environment – this may exceed the amount which is removed by photosynthesis, leading to global warming* *• The need for landfill sites for waste disposal is not matched by the availability of suitable land*
7. Uncertainty and precaution in action *there are a range of possible approaches to sustainability and situations are constantly changing, indicating a need for flexibility and lifelong learning*	*• Every species in an ecosystem, such as a rainforest, must be valued since we are unsure of the knock-on effects of a species' removal on food chains in the system as a whole* *• People can have different views on sustainability issues to do with water which may be in conflict – such as the views of professional fishermen and scientists about catch quotas*

After the first inclusion of ESD in the revised National Curriculum for the year 2000 in England and Wales, ESD has started to appear in the national curriculum agenda. For instance, the Government's Sustainable Development Education Panel (SDEP) has produced the draft national strategy for ESD, *Learning to last* (2003), the Qualifications and Curriculum Authority (QCA) has reported the curriculum guidance for schools (2003), and the Office for Standards in Education has prepared its first report on good ESD practice in primary and secondary schools (2003).

The significant consensus, which was suggested within these reports, dealt with the interdisciplinary approach toward ESD:

Characteristics of curriculum planning to promote ESD are [that]…the key concepts of sustainable development are clearly identified and coordinated wherever they appear in the curriculum and reinforced through all subject areas. (Qualifications and Curriculum Authority, 2003, p. 1)

In schools…the key concepts of ESD must be exemplified within the curriculum and must be coherent across subject areas… (Sustainable Development Education Panel, 2003, p. 4)

The judgments on interdisciplinary characteristic of ESD are coherent with international publications:

Education for sustainable development is interdisciplinary and holistic…learning for sustainable development should be embedded in the whole curriculum, not as a separate subject. (UNESCO, 2004, p. 16)

While the debates on conceptualization of ESD are still going on, the multidimentional view (economic, social, and environmental) on sustainable development and interdisciplinary approach toward ESD are the common aspects of these conceptions. Such a point of view challenges teachers who are required to provide opportunities for student learning involving knowledge, values and skills. The literature on ESD pedagogy stands up for active learning, enhancement of positive attitudes and values, and critical analysis of cultural sensitivity (Ballantyne and Packer, 2005). Björneloo (2004, p.54) argues that *'central concepts in education for sustainable development are independence,*

critical thinking, participation and evaluation of results'. Many researchers have emphasized the main argument that global environmental problems can turn into action only by considering ecological, economic, and cultural differences of our local surroundings (e.g. Dubos, 1980). Hopkins, Damlamian and Lopez Ospina (1996) offered this issue as a key aspect for pedagogy of ESD. The note on global thinking involves controversial issues, because every individual possesses different views and values on his/her causes, impacts and management of environment. Educating students about controversial issues challenges teachers in terms of personal beliefs, bias and balance. For a successful instruction requiring interdisciplinary approaches, it is needed to share experiences and develop mutual interaction regarding different subject areas (Summers et. al, 2005).

2.3.1 Components of Education for Sustainable Development

It is obvious that ESD should not be regarded as just a knowledge base dealt with economy, environment, and society. It also involves problem solving skills, critical thinking skills, values that encourage people for changing toward sustainable lifestyles, and participate in a demographic society. ESD also addresses key points from both local and, when necessary, global aspects of issues. Therefore, McKeown (2002) outlined that five components which are knowledge, skills, perspectives, values, and issues, must be covered in a formal education system that has focused on some reorientations toward sustainability. Furthermore, this author suggested some principles on these five components of ESD as mentioned below.

Knowledge: Sustainable development surrounds environment, economic, and social aspects of issues. For this reason, individuals should be equipped with knowledge base from the field of natural sciences, social sciences, values, humanities to grasp the principles of sustainable development and strategies to universalize its implementation. It might be a challenge in reorientation of school curriculum to decide on knowledge that will support sustainability goals. Communities first select culturally appropriate and locally

defendable goals for sustainability in order to satisfy their current needs without destroying future of the world.

Issues: ESD covers some major points dealing with social, economic and environmental issues threatening the sustainability of the planet. The Earth Summit in Rio de Janeiro (UNCED,1992) addressed many of these key issues in Agenda 21. Understanding and internalization of these issues constitutes the core of ESD and they were listed in Agenda 21 as in Table 2.4.

Table 2.4 Issues in Agenda 21

Section 1 – Social and Economic Dimensions
International cooperation, Combating poverty, Changing consumption patterns, Population and sustainability, Protecting and promoting human health, Sustainable human settlements, Making decisions for sustainable development.
Section 2 - Conservation & Management of Resources
Protecting the atmosphere, Managing land sustainably, Combating deforestation, Combating desertification and drought, Sustainable mountain development, Sustainable agriculture and rural development, Conservation of biological diversity, Management of biotechnology, Protecting and managing the oceans, Protecting and managing fresh water, Safer use of toxic chemicals, Managing hazardous wastes, Managing solid waste and sewage, Managing radioactive wastes.
Section 3 - Strengthening the Role of Major Groups
Women in sustainable development, Children and youth, Indigenous people, Partnerships with NGOs, Local authorities, Workers and trade unions, Business and industry, Scientists and technologists, Strengthening the role of farmers.
Section 4 - Means of Implementation
Financing sustainable development; Technology transfer; Science for sustainable development; Education, awareness and training; Creating capacity for sustainable development; Organizing for sustainable development, International law; and Information for decision making.

In spite of the fact that Agenda 21 pointed out many of the vital issues that has been globally agreed on, some additional ones such as discrimination militarism, renewable energy sources were discussed in non-formal agreements or action plans.

Skills: ESD must provide some opportunities to develop practical skills that will enable individuals to continue learning after they leave school, to have a sustainable livelihood and life styles. These skills should represent three aspects of sustainable development; environment, society, economy. McKeown (2002) states some of these skills: first, the ability to communicate effectively (both orally and in writing), second, the ability to think about systems (both natural and social sciences), the ability to think in time - to forecast, third, to think ahead, and to plan, fourth, the ability to think critically about value issues, fifth, the ability to separate number, quantity, quality, and value, sixth, the capacity to move from awareness to knowledge to action, seventh, the ability to work cooperatively with other people, eighth, the capacity to use these processes: knowing, inquiring, acting, judging, imagining, connecting, valuing, and choosing, and ninth, the capacity to develop an aesthetic response to the environment.

Perspectives: As the debate on sustainable development and education for sustainable development is going on, different views play an important role for ESD. To be able to understand intra-national and international understanding, every individual must consider an issue from another viewpoint besides his/her own.

Values: Enhancement of every citizen's personal value, the values of the society that he/she lives in, the values of others around the world occupies the central part of ESD. Values are taught overtly in formal education in some cultures, but in other cultures, the values are analyzed, explained, discussed or modeled if they are not taught overtly.

Although reorienting education to address sustainability seems to be easy, it is a costly process and some nations cannot afford to rely on a remediation model to retrain the world's teachers (McKeown, 2002). However,

designing new approaches to both pre-service and in-service teachers to address sustainability is of an urgent need.

2.4 Pre-service and In-service Teachers' Perceptions of Sustainable Development

Education for sustainable development is evolving as an increasingly important concept in theory and practice of educational research. Environmental education policy makers indicated the recent movement from traditional approach which is education *about* the environment to a much stronger focus on education *for* the environment. To examine the successful implementations of this new trend in and out of school sectors, some researchers have drawn attention to crucial role of teachers' views on ecological sustainability.

Cross (1998), in his research study, proposed that teachers are the key factors to develop an understanding and promote values and skills among students. However, due to controversial characteristics of environmental issues, teaching about resolution of environmental problems requires critique of society. Teaching profession is not always open to innovations, but it is inevitable that teachers' views covering their teaching and personal outlook can be influenced by social trends. In line with these thoughts, Cross (1998) aimed to investigate in-service teachers' learning about sustainable development and how this concept influenced their teaching. Interviews with five teachers from different subject areas (geography, biology, earth science, environmental studies, chemistry) showed that they were not equipped with the necessary theoretical background information on sustainable development. They were not aware of the main purpose dealing with sustainability. Additionally, the participants were not sensitive toward controversial issues and the contribution that their teaching would make. These teachers were also lack of a sense of hope toward resolution of environmental problems that is what has been called as 'fatalism' (Plant, 1995). It was indicated that teaching in terms of sustainable development requires to strengthen the meaning of this concept and to encourage a more holistic approach for sustainability education with teacher training programs.

The New South Wales Government tried to make an attempt for initiation of ESD within the school culture and encouragement of society to engage with environmentally sustainable actions. In a research study, Taylor, Nathan and Coll (2003) proposed that the achievement of this goal strongly depends on local teacher's beliefs and attitudes, since teachers are the key factors that support community participation to sustainability. Thus, these authors examined in-service teachers' perceptions of education for sustainable development as an indicative for success of the new government policy on environmental education. A qualitative approach was chosen for the methodology of this educational inquiry. A purposeful sample of 13 teachers from both primary and secondary schools was generated as the core of this study. In selection of this sample, the researchers consulted to a member of a regional environmental centre who suggested that these teachers had committed to environmental issues and would provide an insight into teachers' beliefs of ESD. Of the teachers participated in this study, six were primary (4 female and 2 male) and seven were secondary (5 female and 2 male) drawn from science, geography and the earth sciences. In the semi-structured interviews, the teachers were asked if they had heard about the concept of ESD. Those who had come across with this concept were probed as to their understanding of the term. On the other hand, the interviewees unfamiliar with the term were asked to consider the term in the context of the interview. The participants were also asked to describe their teaching practices in ESD and their beliefs on contribution of ESD in delivering aspects of ESD. It was an unexpected result that the notion of sustainable development and ESD was relatively new for most of the participants. In other words, this group of teachers acquired little explicit knowledge of ESD despite their environmental interest. The researchers recommended that the newly stated government policy may encourage the educators to introduce the concept of sustainability and promote the principles of ESD such as relevance, action-orientation, critical thinking and enhancement of desired values in students. Fortunately, although few participants were reported to be familiar with the concept of ESD, they generally developed an intuitive understanding of this term

and how it might differ from traditional environmental education. Moreover, all of the interviewees proposed that political issues and social justice needed to be emphasized by teachers during their practice of environmental issues. These teachers believed that achieving the goal of sustainability is open to doubt, but anyway education was offered as the best hope.

With similar aids in the study of Taylor *et.al* (2003), Summers, Corney and Childs (2004) tried to explore any gap between pre-service teachers' conceptions of sustainable development and conceptualization through CEE publication. A questionnaire consisting of open-ended items on sustainable development was administered to science and geography students following the Post Graduate Certificate in Education (PGCE) course. PGCE course offers an opportunity for joint sessions of geographers and scientists to learn a number of sustainable development topics (e.g. climate change, species loss, energy use and supply) through seven dimensions of ESD. Pre-service teachers were asked to explain what is meant by 'sustainable development' and the difference between ESD and environmental education. The findings of this study reflected that compared with scientists, geographers were more aware of the scope of sustainable development, especially with their environmental, economic and social considerations. However, both geographers and scientists could not identify seven dimensions in the framework of ESD. Very low numbers of students mention 'Diversity' and 'Uncertainty and Precaution' spheres of ESD as relevant issues. In line with these responses, the researchers emphasized a strong need to broaden the conceptions of sustainable development for both geography and science teachers. Regarding the relationship between ESD and environmental education, pre-service teachers view ESD as a broader concept than environmental education. At this point, it was noted for teacher educators that they have to prepare well-informed teachers who have thought critically about sustainability and can actively engage in teaching practices for ESD in their schools.

Following this research study (Summers, Corney and Childs, 2004), Summers, Childs and Corney (2005) examined the views of experienced teachers

(geography and science school mentors) that supervised the pre-service geography and science teachers following PGCE course. These authors emphasized the strong need for mentors that has developed broad subject-matter knowledge of sustainable development in line with the view of Kysilka (1998). According to Kysilka (1998), deep subject-matter knowledge is an indispensable factor that affects successful implementations of interdisciplinary approaches. Summers *et al.* (2005) suggested that to prepare well-informed student teachers on sustainable development, mentors should encompass helping trainees to see the interconnectedness of content and assortment of different content areas. In this aspect, these researchers focused on conceptions of sustainable development and pedagogy for ESD held by school mentors, school mentors' readiness for mentoring in this area, and their professional development needs. The replies to questionnaires developed by these researchers and interviews showed that the school mentors did not follow the interdisciplinary approaches. In addition to this, pre-service teachers developed a more comprehensive understanding for sustainable development than their mentors, especially in the area of science. For both pre-service teachers and mentors, scientists did not possess a deep understanding of sustainable development as well as geographers. Compared with the Sustainable Development Education Panel framework of ESD, the conceptualizations of sustainable development expressed by pre-service teachers and mentors were narrow. Geography mentors seemed to have an appropriate perspective for pedagogy of ESD including active participation. Due to lack of subject knowledge in the area of ESD, mentors could not perceive themselves well prepared for teaching through sustainable development.

In context of Turkey, there has been limited number of research studies examining pre-service teachers' opinions on sustainable development. Alkis and Ozturk (2007) conducted a study in order to determine geography pre-service teachers' understanding of and attitudes towards the concept of sustainable development. In this aspect, these researchers administered a semi-structured questionnaire to totally 165 third-year students who had enrolled all geography modules. Consistent with previous research studies (e.g Cross, 1998; Summers,

Corney and Childs, 2004) it was found that these participants did not have satisfactory level of knowledge on sustainable development. Some of the participants associated this concept with effective use of natural and resources. Or, they linked this concept with the long-term development plans and identified it as maintained (continuous) development. On the other hand, geography pre-service teachers could not develop an understanding of sustainable development in the context of poverty, social equality, human well-being, and social inclusion. Furthermore, the participants usually had favorable attitudes towards sustainability issues in local and national scale. But, the same trend could not be observed when it comes to global social issues such as poverty and underdevelopment. At this point, it was added that places and societies are associated with each other in various ways and the boundaries set between different places and societies are not as clear as ever before. In this aspect, the participants seemed to ignore one of the basic notions of geography which is the perspective of 'from local to global'. This study indicated that teacher education programs should facilitate pre-service teachers dealing with the discipline of geography in creating their own sustainable life, those of others and their interactions with each other on the planet.

In line with these research studies it can be concluded that in-service teachers or future implementers of education for sustainable development could not develop a sound understanding of sustainable development. However, they should have both subject and pedagogical expertise, and be well prepared for teaching in this area to achieve sustainability transition.

2.5 Students' Views on Sustainable Development and Sustainability

Education for sustainable development started to infuse into higher education programs with the establishment of the United Nations Decade for Education for Sustainable Development. In 2005, Haigh advocated that it is time for academicians to make deep and drastic changes in higher education institutions in order to create a sustainable world.

Following guidelines through education for sustainable development, engineering higher education program developers has started pay attention to training of engineers from new generation efficiently in sustainable development (Forum for the Future, 2002). In this regard, to enable a better infusion of sustainability education into engineering curriculum, Azapagic, Perdan and Shallcross (2005) carried out a survey focusing on knowledge level and gaps of undergraduate engineering students about sustainable development. The analysis of data collected from both developed and developing countries indicated that the respondent students did not acquire a satisfactory level of knowledge and understanding of sustainable development and there exists significant knowledge gaps with respect to two aspects (social and economic) of sustainable development. In contrast, these students had a strong tendency to support the statements referring the importance of sustainable development for them personally and as engineers, but they could not overcome difficulties in making a linkage between the theory of sustainable development and engineering practice. An encouraging result of this survey was that sustainable development was perceived as more important for future generations than for them as an individual. Therefore, students need to understand that everyday choices or activities directly influence the future consequences. This may encourage them to learn more about sustainable practices in their professional life.

In the context of UK where the government enforces both school and higher education sectors to commit sustainable development, numerous centers are working to include components and key principles of sustainable development in the educational programs. Kagawa (2007) conducted a research study at the University of Plymouth, where the Center for Sustainable Future provides students infrastructures to engage in sustainable activities. The main aim of the survey was to investigate university students' current understandings and perceptions of, and attitudes toward sustainable development and related issues. The findings of this study showed that both the students who are familiar with the term "sustainable development" and those who are not, held a favorable attitude toward sustainability. In contrast, these students could not develop a sound

understanding of sustainability in that they viewed the concept as predominantly linked with environmental issues. Economic, political, cultural and social dimensions were less likely emphasized in the statements of the participants. These knowledge gaps were also existed in the university students which were investigated in previously conducted research studies (Summers, Corney and Childs, 2004; Azapagic *et al.*, 2005). Looking at students' perceptions of sustainability and their behavior determinations at the University of Plymouth, they supported critical or radical views on behalf of environmental and social justice. On the other hand, when examining personal behavioral changes, their individual lifestyle preferences were not congruent with their critical or radical principle aspects. In line with these findings, the author suggested curriculum development in order to include interconnectedness of different aspects (economic, social, and environmental) of sustainability. In this manner, students grasp contradictory or complex issues or challenges behind the concept of sustainability. Since the participants clearly marked actions that require changing purchasing habits, recycling, saving energy and water, the university campus should create opportunities to facilitate those pro-sustainability actions.

2.6 Attitudes, Values, and Behaviors toward Sustainable Development

To acquire the goals of sustainable development – meeting human needs, reducing hunger and poverty, prevention of discrimination (e.g sexual and racial) while preserving the natural capita – requires some changes in human values, attitudes, and behaviors (Raskin, 2002).

Worldwide surveys did not investigate public attitudes toward sustainable development as a holistic concept. However, some research studies are available dealing with economic development, human development, and consumerism as the subcomponents of sustainable development. Global economic development as well as human and social development has emerged as a central issue through sustainable development. The research studies (Pew Research Center for the People and the Press, 2003) conducted to determine

public attitudes toward economic development indicated the strong desire for economic development in all cultural and national contexts. This view was supported by more than large majorities from 35 developing countries who stated that living in a country where there is economic prosperity is very important or somewhat important. Concerning public attitudes toward human development, there is not sufficient data available to make strong inferences about this construct. However, limited research studies (Pew Research Center for the People and the Press, 2004) showed that human well-being had appeared to deteriorate in recent years. Participants' responses on unavailability of well-paying jobs, working conditions, the spread of diseases, insufficient health care and living conditions of the unemployed pointed out the declination of living standards which is the major indicator of human development.

Although there were very limited research studies focusing on attitudes toward human and economic development, most research gave attention to anthropocentric concerns about environmental trends with disregarding the ecocentric concerns about the intrinsic value of nature. The World Values Survey (Inglehart, Basanez, Diez-Medrano, Halman, and Luijkx, 2002) conducted across 27 countries including Turkey pointed out that 76 percent of the participants stated that human beings should coexist with nature, whereas 19 percent claimed that they should master nature. Europeans, North Americans, and Japanese were mostly among the respondents indicating the necessity to coexist with nature. However, respondents from Jordan, Vietnam, Tanzania, and Philippines reported that they should master nature. National part of World Values Survey for United States showed that these people had a strong belief that nature has intrinsic value and human beings have moral duties and obligations to animals, plants, and non-living things. The findings indicated that Americans did not agree with the statements like *"Human beings have the right to alter nature to satisfy their wants and desires"*, *"Humankind was created to rule over nature"* and *"Humans are not part of nature"*. Supporting these views, almost all of the participants also claimed that *"Nature has values within itself regardless of any value humans place on it"* and *"Humans should adapt to nature rather than modify it to suit*

them". This limited data on values toward environment indicated the importance given to nature and rejection of domination over nature at least at an abstract level.

Regarding the interaction between economical, social and environmental aspects of sustainable development, a worldwide survey (Inglehart et. al 2002) examining public views on environmental policies found that more than half of the people (62%) supported the increase in taxes if the extra money were used to prevent environmental damage whereas 33 percent of the respondents they would not accept to make such an economical sacrifice. A further research study was conducted by Tuncer, Sungur, Tekkaya and Ertepinar (2005) questioned young citizens' opinions on the link between environment, economy, and social life in Turkey. The results indicated that Turkish young people were worried about environmental deterioration and did not support the idea of leaving environmental solutions just to science and technology. Furthermore, they believed the interaction between economic growth, industrialization and environmental concerns. These young citizens also advocated that they would not accept to ignore environmental concerns for the sake of industrialization although they thought industrialized societies to have a high standard of living. Since 2000, there has been attempt to support environmental protection globally with the aid of governmental regulations and laws. For instance, a large majority of people participating in the worldwide survey reported by Inglehart et. al (2002) claimed that their national regulations and laws did not play a crucial role to prevent environmental deterioration. Consistent with these research results, The 1992 Health of the Planet survey (Dunlap, Gallup and Gallup, 1993) showed that most of the participants (78%) declared their wants from their own national government to support international agencies financially to work on resolution of global environmental problems.

Material consumption was advocated as a vehicle for translation of values and attitudes into environmentally sustainable behaviors (Leiserowitz, Kates and Parris, 2005). In 2002, Environics International, which was conducted in totally 2 developed and developing countries, stated that less than half of the

respondents had avoided a product or brand due to environmental concerns (36%), refused packaging (27%), and only 25 percent of the respondents had gathered environmental information. On the other hand, recycling was more common in these countries. Large majority of people (60%) set garbage for reuse, recycle, or safe disposal. With respect to different cultural settings, North Americans (91%) had a tendency to use recycling methods more than Latin Americans, Central Asians, and Eastern Europeans (36%-38%) did. These results were attributed to structural barriers in these societies such as inadequate infrastructures, regulations, or markets. In addition, a worldwide survey (Inglehart, 2000) reported that nearly half of the respondents had tried to choose products better for the environment (46%), reduced their own water consumption (50%), and reused or recycled something rather than throwing it away (48%). Comparing the responses of participants from high-income and low-income countries, richer societies (67%) preferred to choose "green" products more than poorer societies (30%) did. Similarly, 75 percent of high-income citizens stated that they had reused or recycled, while 27 percent of citizens from low-income countries preferred to reuse or recycle. On the other hand, these results were contradicted with the findings a research study conducted by Rogerson (2001). This researcher's observations showed that many people in developing countries were used to reuse things in their daily lives instead of throwing them away actually. Leiserowitz, Kates and Parris (2005) advocated that this inconsistency between research results might be due to inadequate survey representation of the very poor people that have to reuse and recycle as part of survival, or, alternatively, different cultural interpretations of the concepts "reuse" and "recycle". Although people have had favorable attitudes, values and behaviors toward the environment in recent years, they do not favor engagement in a political action for the sake of environment. Inglehart (2000) reported that less than one quarter of the participants (13%) had attended a meeting to protest a treat for the environment, enrolled in an environmental organization, or signed a petition to protect the nature. A forthcoming study (Environics International), in 2000, indicated that only 10 percent of the worldwide respondents had written a

letter or made a telephone call to express their concern about an environmental issue in the past year. Similarly, only 11 percent of the respondents supported or belonged to an environmental group, and 18 percent had given a vote by considering the views of political party on environmental issues.

As it was mentioned above, public support for sustainable development has never been questioned globally. However, the literature review on subcomponents of sustainable development indicated that the global public had favorable attitudes and values toward the main tenets of sustainable development. Despite the reports on attitudes and values related to sustainability issues, at this point it should be noted that what people say contradicts with what they actually do in general.

2.7 Studies on the Relationships among Attitudes, Values, and Behaviors toward Sustainable Development

With the movements toward sustainable development initiated by The Earth Summit (UNCED, 1992) in Rio de Janeiro, a strong emphasis was placed on encouragement of public actions taken toward sustainable lifestyles. In the United Kingdom, which is among the frontier countries of sustainable development, the strategies proposed by governmental institutions (Department of Environment [DoE], 1994; Department of the Environment Transport and the Regions [DETR], 1999) have also promoted active participation of all citizens for resolution of sustainability problems. In addition, Department of Environment Food and Rural Affairs (2002, p.7) reported:

"Sustainable development cannot be imposed from above. It will not take root unless people across the country are actively engaged."

Supporting the ideas toward active engagement for sustainable development, it has been advocated that our social, economic and environmental systems would not collapse if we took right decisions in the right time (Forum for the Future, 2002). It was added that every citizen should hold the right knowledge, appropriate skills, favorable attitudes and values to ensure construction of sustainable life styles with the right actions.

Psychologists have widely pointed out that values accompanied by attitudes and belief systems are among the variables significantly linked to behavior (Murray and Murray, 2007). Oskamp (1991) proposed a simplistic three component model (Figure 2.3) on the relationship between the three elements, namely; feeling elements, cognitive elements, and behavior. However, Murray and Murray advocated that there are some points which are questionable about the model. For instance, it is not clear whether values are found at the center that affect behavior or alternatively, values and beliefs act together to form the attitudes that contribute to behavior. On the other hand, it is obvious that values and attitudes have a significant influence on formation of behaviors. Interestingly, it was also advocated by some researchers (e.g Rokeach, 1976) that attitudes and values can be learned. Reich and Alcock (1976, p.11) supported:

"We are not born with them, nor are they acquired by physiological maturation. Attitudes are… acquired or learned".

From a perspective of achieving sustainability goals, these views highlights that attitudes and values need to be promoted at all levels, personal, cultural and institutional in order to encourage friendly behavior (Murray and Murray, 2007). Furthermore, the Earth Charter (UNESCO, 2000) emphasizing the crucial role of values in all educational settings also proposes that every citizen should have favorable values to become a key agent for the society.

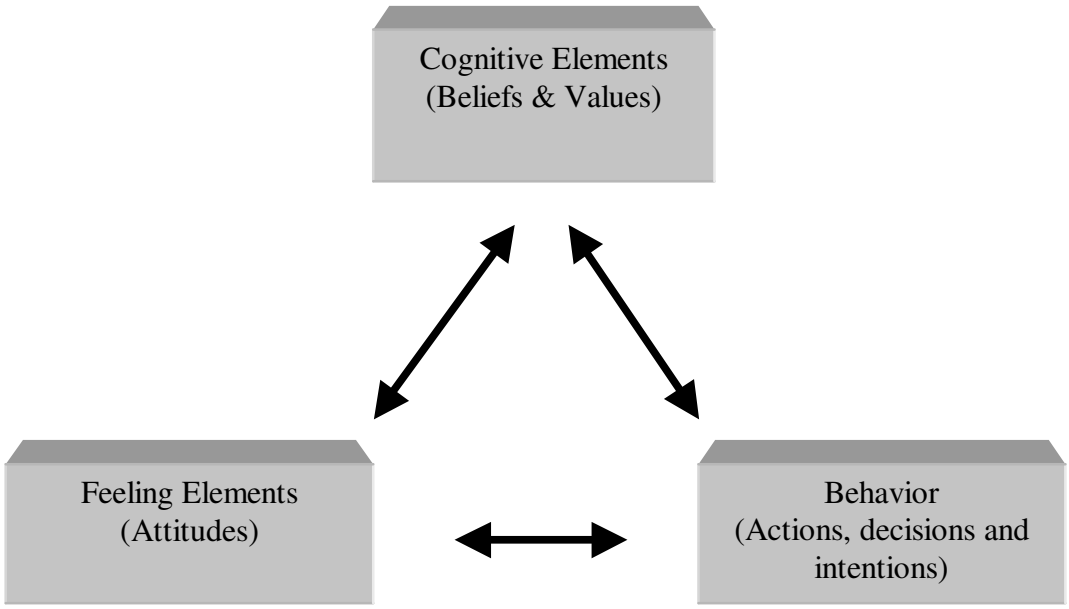

Figure 2.3 Tri-component model of behavior

Barr (2003) outlined the variables that have some roles in determination of behaviors. Parallel with the simplistic tri-component model of behavior proposed by Oskamp (1991), Barr (2003) emphasized the role of values, situational factors, and psychological variables on formation of behaviors as presented in Figure 2.4. Looking at the role of values, the researcher claimed that empirical research indicated three continua of values that are related to behavior toward sustainability. Firstly, consistent with the views of Stern et al. (1995) and Corraliza and Berenguar (2000), he argued that people could be placed on value continua ranging from 'egoistic' to altruistic' and from 'conservative' to 'open to change'. Stern et al. (1995) and Corraliza and Berenguar (2000) provided evidences in their research studies indicating that altruistic people and who are open to change had a tendency to actively engage in environmental actions. Secondly, Barr (2003) also proposed a relational value continuum by incorporating the studies of Schwartz (1992), Dunlap and Van Liere (1978), and Dunlap et al. (2000). With respect to this value continuum, 'biocentrism' is found at one end and 'anthropocentrism' is placed at the other end. Barr (2003, p. 229)

summarized that "*Biocentrism conceptualizes the human relationship with nature as egalitarian and promotes a belief that nature has intrinsic value, whereas anthropocentrism can be characterized as the dominance of humans over nature, with nature being explicitly for human use and thus containing no intrinsic value"*. Steel (1996) supported the idea that an individual with a biocentric value system is more likely to take part in environmental behavior by providing an evidence from a Canadian sample. Thirdly, Barr (2003) conceptualized values as belief driven, namely, 'ecocentrism' and 'technocentrism'. An individual having an ecocentric point of view believes that problems related to sustainability could be resolved by removing some conflicts between society and nature. However, technocentrists advocate that unsustainable actions and decisions are intrinsically the result of a lack of technological development and modernization in technology will overcome environmental challenges. Barr (2003) concluded that behaviors toward sustainability are influenced by environmental values. However, the researcher added that there is a doubt whether environmental values have a direct or an indirect effect on behaviors.

Another group of variables that have a role in shaping behaviors was named as situational factors by Barr (2003). An individual's experience of the relevant behaviors, socio-demographic make-up, and access to relevant sustainability services may be provided as a set of variables that constitute these situational factors. The literature review showed that individuals who had greater access recycling schemes, local bus services or the opportunity to purchase 'green products' had a general tendency to take pro-environmental actions (Derksen and Gartell, 1993). Considering the socio-demographic variables, a wide range of variables such as age, income, gender, family type and education have taken the attention of many researchers (Hines, Hungerford and Tomera, 1987; De Oliver, 1999). Hines, Hungerford and Tomera (1987) reported that younger, female, well-educated and wealthy individuals coming from nuclear families were more likely to show behaviors supporting sustainability. Furthermore, in the context of Turkey some research studies (Tuncer, Tekkaya and Sungur, 2006; Tosunoglu, 1993; Tuncer, Sungur, Tekkaya and Ertepinar, 2005) showed that females were

more likely to show feelings of concern, verbal commitment toward sustainability related issues, and as a result readily take the necessary action to create sustainable futures. On the other hand, some of the researchers such as De Oliver (1999) provided some evidences indicating that the trends proposed by Hines, Hungerford and Tomera (1987) were totally the inverse.

The last group of variables outlined by Barr (2003) was psychological variables linked to personal behaviors toward sustainability. For instance, Hopper and Nielsen (1991) advocated that actions taken toward sustainable life styles can be named as 'altruistic' behavior. These researchers, who focused on formation of recycling behavior in their studies, showed that individuals with feelings of responsibility and without any penalty had a higher tendency to recycle their solid wastes regularly than those who believed that this responsibility belonged to other people. Furthermore, intrinsic motivation could be demonstrated as a psychological variable that is related to behaviors toward sustainability. De Young and Kaplan (1985) reported that satisfaction from a pro-environmental action such as feelings of well-being and self-worth leads to maintain behavioral commitment of the individual. From another point of view, Baldassare and Katz (1992) have proposed that the threat posed by environmental problems, such as climate change or ozone layer depletion, can have a direct influence on the degree to which individuals are encouraged to change their actions as a reaction to this environmental problem.

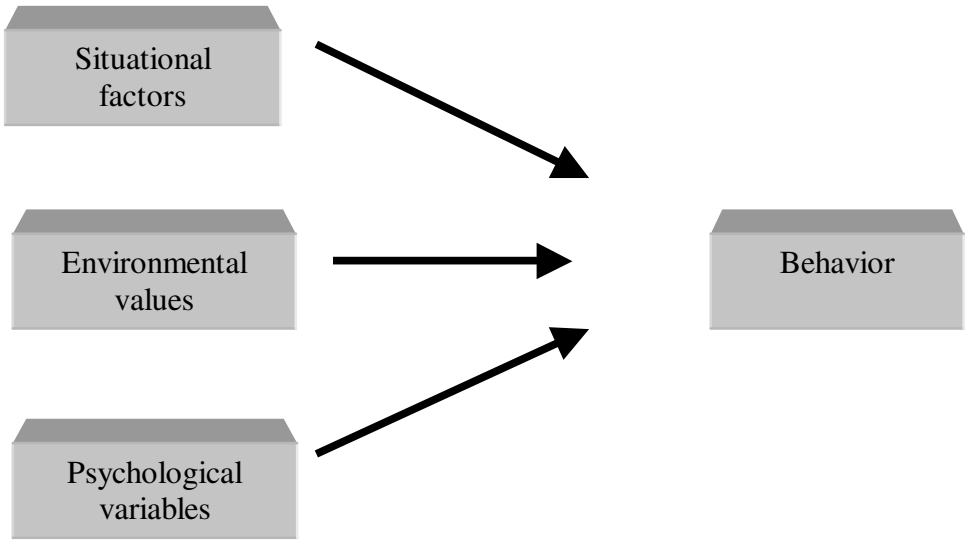

Figure 2.4 Conceptual framework outlined by Barr (2003)

This literature review shows that to predict the indicators of behaviors toward sustainable development, examining cognitive variables is not certainly sufficient. But, affective variables accompanied with situational factors should be also considered in modeling sustainable behaviors, the main goal of education for sustainable development.

2.8 Sustainable Development and Education in Turkey

Algan and Mengi (2005) has outlined Turkey's sustainable development policies through European Union membership process. These authors suggested that environmental policies of regional and/or global international organizations such as United Nations and the Council of Europe play an important role in national policies of Turkey as a member of these organizations. It was also advocated that 1987 Brundtland Report has also influenced Turkey's environmental policies. Thus, an approach toward sustainable development has begun to appear in official government policy documents. This date has been reported to be very significant for Turkey, because it was when Turkey applied for full-membership of to the European Union.

After Turkey's application for full-membership in 1987, Turkey-EU relationships gained a new momentum. Some environmental regulations published after this date to demonstrate relative compliance with EU directives in terms of general goals and specific criteria. However, Algan and Mengi (2005) noted that Turkey could not be considered to have made the necessary adjustments for integration with respect to sustainable development. This deficiency has been emphasized in every progress report that has been published with regard to the national preparations of Turkey. The fundamental reason for the current state of affairs was attributed the fact that Turkey seemed to have adopted policy principles that included the goals of sustainable development in the development plans of the 1980' and 1990', but it has showed a different approach since the 2000's. The development plan of 2000's has focused on economic growth policies. Another fundamental reason is based on the fact that Turkey is experiencing the environmental problems of developed countries while at the same time struggling with the environmental problems of developing countries. This evaluation has indicated the need for investment in environmental infrastructures. For instance, according to Preliminary National Development Plan (PNDP), although total predicted investment costs for preservation of water resources, productivity of drinking water, sewerage services and solid waste management are considerably high, majority of the municipalities in Turkey do not have waste water treatment and garbage storage facilities equipped with appropriate technical systems. However, according to the State Statistics Institute (2004) data approximately half of the public investment in the environment was devoted to management of drinking and municipal water. Additionally, more than one-third of the investment was used for waste water management, and the rest of this investment was for other environmental activities.

The performance level of the economic growth policy may be considered as the most outstanding obstacle in Turkey's integration of the principles of sustainable development with other sectors (Algan and Mengi, 2005), so it is worth paying some attention. Turkish Human Development Report (United Nations Development Program, 2004) showed that from 1975 to 2001

Gross National Product (GNP) per capita in Turkey increased less than three percent at an annual rate and it ranked 96th on the Human Development Index. In 2004, it ranked 76th out of 177 countries in economic development and 88th in human development. In this report (UNDP, 2004) it was claimed that Turkey had fallen behind countries like El Salvador, Iran, and Thailand, so Turkey could not advocate that it was successful with increasing its GNP per capita toward its sustainable economic growth in the past years.

These statistical evaluations indicate that Turkey has made no significant progress in integration of principles of sustainable development in the context of economy, social life and environmental protection. For this reason, new enterprises in the field of education for sustainable development have much to do in this aspect. In other words, while looking at the deficiencies in attainment of sustainable development goals in Turkey, education for sustainable development could be regarded as an effective tool that facilitates the process of sustainable development.

In Turkey, formal school education has paid great attention to educate future citizens to prevent environmental problems and develop an understanding of environmental issues. However, interaction of environmental quality with economy and social life is often neglected while preparing formal school curriculum in Turkey. The initiatives in order to protect nature and take some precautions towards a healthy life began with the 1961 Turkish Constitution. The concept of *"environment"* was firstly mentioned in this constitution in the article 49 with the statement of "*everyone's physical and mental health should be protected"* (Ozdemir, 2003). On the other hand, it was after the 1982 Turkish Constitution that the concept of "environment" infused into formal school curriculum as a result of environmental crisis exploded in these years (Dogan, 1997; Ozdemir, 2003). During the 1990s, some national projects which stressed "education for the environment" at the primary school education were initiated. In 1994, the Seventh Five Year Development Plan Environment Commission stated the role of environment and environmental education in shaping human life

in its report. This enterprise has indicated the support of Turkish government towards environmental education.

As a non-governmental organization, The Turkish Environmental Education Foundation, which was founded in 1993, has signed under the contract of some environmental education projects (e.g. the "Eco-School" and "Young Reporters for the Environment"). These projects aimed to enhance pupils' environmental awareness, gain a satisfactory level knowledge on environmental issues, and take an active role in creating environmentally sensitive societies. These students are required to study and take an action on some basic environmental issues such as garbage and contamination, energy and recycling, and water and then its subcomponents. The success of the schools participating in these projects are evaluated by the national coordinators Furthermore, an extracurricular material supporting education for sustainable development, The Green Pack Project is carried out with association of The Regional Environmental Center, Turkish Bird Research Society, Nature Society, Ministry of National Education, Ministry of Environment and Forestry, some of the related institutions, and non-governmental organization. This collaboration has prepared a multi-media kit which consists of syllabuses for teachers' use, a 'mutual game', information documents for students, and a VCD/DVD and CDROM. The primary aim of this project is to develop an understanding of sustainable development in elementary schools while making the necessary contribution to increase knowledge, awareness, values, and behaviors towards sustainable life styles. Thus, The Green Pack Project is expected to transform sustainable life styles from Turkish youngsters to other members of the society.

Examining formal school curricula prepared up to the present, it could be observed that elementary school science curricula prepared in 1992, 2000, and 2004 showed higher tendency to infuse environmental issues into related scientific topics. For example, 1992 elementary science curriculum covered some issues linked with the biodiversity, living organisms and life, the universe, and the interaction between human and nature. These issues were also emphasized in elementary science curriculum which was developed in 2000. Furthermore, this

curriculum focused on development of future citizens' environmental knowledge and awareness. However, it was shown that the 1992 and 2000 elementary science curriculum did not fulfill Turkish citizens' needs because elementary school students who participated in international studies of TIMSS and PISA got low science scores. In this aspect, the Turkish Education System has been forced to make some reform movements at elementary school education since 2004 (Board of Education [Talim Terbiye Kurulu Başkanlığı], 2004). Newly developed Science and Technology curriculum (6-8) has showed greater emphasis on the environment related objectives, and aims to enhance students' knowledge, attitudes, skills, and behaviors toward the environment. Environmental issues have been also introduced into Social Sciences, Life Studies, Health Education, Citizenship and Human Rights Education, and Special Education since 2004.

To sum up, this literature review shows that Turkey is at the primitive stage in developing educational programs infusing principles of sustainable development. There has been no well developed national strategy in order to educate future citizens who are ready to take the necessary actions towards sustainability.

CHAPTER 3

DESIGN OF THE STUDY

The present chapter is devoted to information about the population and sampling, description of variables, measuring instruments, data collection and statistical techniques utilized in the analysis of data, assumptions and limitations of the study.

3.1 Population and Sample

This research was desired to be a national study and as the target population all university students enrolled in an undergraduate or graduate program in Turkey were identified. However, an accessible population was compulsorily determined, since it was not feasible to study with this target population. All students enrolled in an undergraduate or graduate program at Middle East Technical University in Ankara were defined as the accessible population of this study to which we will be able generalize the findings. Due to the specific purpose of the study that is to reorient the undergraduate or graduate education programs for sustainability education, a sample constituted from students enrolled in one of these programs at Middle East Technical University in Ankara was generated through convenience sampling.

The population of Middle East Technical University students sampled in this study was totally 20957 students in 2007-2008 academic year; 2614 (12,5%) of whom were enrolled in an English preparation class, 12035 (57,4%) of whom were enrolled in an undergraduate program, and 6308 (30,1%) of whom were enrolled in an graduate program. Total number of male students constituting the population sampled in this study was 12156 (58%), while the number of female students in this population was 8801 (42%). Regarding the distribution of these students with respect to faculties at METU, the number of students enrolled in Faculty of Engineering (N=9589 (45,7%)) was higher than that of the students in

the other faculties at METU. On the other hand, Faculty of Architecture had the least number of students (N=1088 (5,9%)) in 2007-2008 academic year. Looking at the distribution of students with respect to graduate schools at METU, most of these students were enrolled in Graduate School of Natural and Applied Sciences (N=897 (4,3%), while the number of the students enrolled in Graduate School of Marine Sciences were only 7 (0,03%). The details of METU students' profile were presented in Table 3.1.

Table 3.1 Profile of Middle East Technical University Students

Faculty/Grad. Sch.		Prep.	Undergraduate	Graduate	Total
Faculty of Architecture	**Female**	92	438	156	686
	Male	50	280	72	402
	Total	142	718	228	1088
Faculty of Arts and Sciences	**Female**	361	1239	476	2076
	Male	255	594	384	1233
	Total	616	2193	860	3309
Faculty of Econ. and Admin. Scie.	**Female**	190	798	276	1264
	Male	186	888	206	1280
	Total	376	1686	482	2544
Faculty of Education	**Female**	209	971	211	1391
	Male	161	599	110	870
	Total	370	1570	321	2261
Faculty of Engineering	**Female**	286	1411	570	2267
	Male	824	4817	1681	7322
	Total	1110	6228	2251	9589
Grad. Sch. of Applied Mathematics	**Female**	0	0	76	76
	Male	0	0	87	87
	Total	0	0	163	163
Grad. Sch. of Informatics	**Female**	0	0	103	103
	Male	0	0	290	290
	Total	0	0	393	393
Grad. Sch. of Social Sciences	**Female**	0	0	497	497
	Male	0	0	209	209
	Total	0	0	706	706

Table 3.1 (cont'd)

Grad. Sch. of Nat. and App. Sci.	**Female**	0	0	439	439
	Male	0	0	458	458
	Total	0	0	897	897
Grad. Sch. of Marine Sciences	**Female**	0	0	2	2
	Male	0	0	5	5
	Total	0	0	7	7
METU	**Female**	1138 (5,4)	4857 (23,2)	2806 (13,4)	8801 (42,0)
	Male	1476 (7,1)	7178 (34,2)	3502 (16,7)	12156 (58,0)
	Total	2614 (12,5)	12035 (57,4)	6308 (30,1)	20957 (100,0)

A total of 958 METU students completed the web-based questionnaire on university students' views of sustainable development prepared by the researcher in 2007-2008 academic year spring semester. Participants' distribution with respect to faculties, graduate schools, and departments presented in Table 3.2 indicated the consistency between the frequency distributions of the population and the sample regarding the faculties and graduate schools. Looking at the participants' faculties, the rate of participation was highest for Faculty of Engineering students (N=341 (35,6%)), while minimum rate of participation belonged to the students from Faculty of Architecture (N=48 (5,1%)). Concerning the participants' distribution with respect to graduate schools, a total of 26 (2,6%) students from Graduate School of Social Sciences participated in this study. However, there were only 1 (0,1%) student from Graduate School of Applied Mathematics who participated in this study. Moreover, none of the students from Graduate School of Marine Sciences completed the web-based questionnaire.

Table 3.2 Sampling Distribution with respect to Faculties/Graduate Schools and Departments

Faculties and Departments	**N**	**Percent**
Faculty of Architecture	**48**	**5,1**
Industrial Design	17	1,8
City and Regional Planning	16	1,7
Architecture	15	1,6
Faculty of Arts and Sciences	**183**	**19,1**
Statistics	31	3,2
Sociology	27	2,8
Physics	26	2,7
Mathematics	23	2,4
Biology	17	1,8
Chemistry	17	1,8
Psychology	15	1,6
Philosophy	13	1,4
Molecular Biology and Genetics	11	1,1
History	3	0,3
Faculty of Economic and Administrative Sciences	**115**	**12,0**
Business Administration	31	3,2
Political Science and Public Administration	30	3,1
International Relations	29	3,0
Economics	25	2,6
Faculty of Education	**141**	**14,7**
Elementary Science Education	43	4,5
Foreign Language Education	27	2,8
Computer Education and Instructional Technology	23	2,4
Elementary Mathematics Education	22	2,3
Secondary Scien. and Math. Education	14	1,5
Early Childhood Education	6	0,6
Educational Sciences	6	0,6
Faculty of Engineering	**341**	**35,6**
Electrical and Electronics Engineering	57	5,9
Mechanical Engineering	48	5,0
Civil Engineering	44	4,6
Chemical Engineering	28	2,9
Environmental Engineering	28	2,9

Table 3.2 (cont'd)

Geological Engineering	26	2,7
Industrial Engineering	23	2,4
Metallurgical and Materials Engineering	23	2,4
Food Engineering	19	2,0
Computer Engineering	19	2,0
Mining Engineering	12	1,2
Aerospace Engineering	9	0,9
Petroleum and Natural Gas Engineering	5	0,5
Graduate School of Informatics	**8**	**0,8**
Information Systems	5	0,5
Cognitive Sciences	2	0,2
Health Informatics	1	0,1
Graduate School of Applied Mathematics	**1**	**0,1**
Financial Mathematics	1	0,1
Graduate School of Natural and Applied Sciences	**8**	**0,8**
Biotechnology	7	0,7
Restoration	1	0,1
Graduate School of Social Sciences	**26**	**2,6**
Elementary Scien. and Math. Education	10	1,0
Settlement Archaeology	3	0,3
Media and Cultural Studies	3	0,3
Urban Policy Planning & Local Government	3	0,3
Eurasian Studies	1	0,1
European Studies	1	0,1
Middle East Research Studies	1	0,1
Architectural History	4	0,4
Missing	**87**	**9,1**
TOTAL	**958**	**100**

Table 3.3 presents frequency distribution with respect to participants' grade level and sex. Of the participants, 66 (6,9%) were students from English preparation classes, 593 (61,9%) were enrolled in an undergraduate program, and 252 (26,4%) were enrolled in a graduate program at METU. Most of the English preparation class students (30 females (45,5%); 36 males (54,6%)) and

undergraduate students (291 females (49,1%); 300 males (50,6%)) were male, while the rate of female graduate students was higher than that of male graduate students (146 females (57,9%); 106 males (42,1%)).

Table 3.3 Sampling Distribution with respect to Grade Level and Sex

	Sex		
	Female	**Male**	**Missing**
Grade Level			
Prep. (N=66)	30 (45,5)	36 (54,5)	0 (0,0)
1st (N=116)	53 (45,7)	62 (53,4)	1 (0,9)
2nd (N=112)	53 (47,3)	58 (51,8)	1 (0,9)
3rd (N=164)	80 (48,8)	84 (51,2)	0 (0,0)
4th (N=201)	105 (52,2)	96 (47,8)	0 (0,0)
MS. (N=175)	105 (60,0)	70 (40,0)	0 (0,0)
Ph. D. (N=77)	41 (53,2)	36 (46,8)	0 (0,0)
Missing (N=47)	12 (25,5)	6 (12,8)	29 (61,7)
Total (N=958)	479 (50,0)	448 (46,8)	31 (3,2)

Concerning the education level of participants' parents (Figure 3.1), relatively small number of parents (1,4% of mothers; 0,3% of fathers) was illiterate. More than one quarter of mothers have attained elementary or middle school education, while the rate of fathers with elementary or middle school education was less than one quarter (28,0% of mothers; 16,4% of fathers). The percentages of fathers and mothers having high school education were 27,1% and 22,8%, respectively. On the other hand, the rate of fathers attained university education and higher degrees (55,1%) was greater than that of mothers attained university education and higher degrees (38,7%). These frequency analysis results indicated that participants' fathers attained higher education levels than their mothers did.

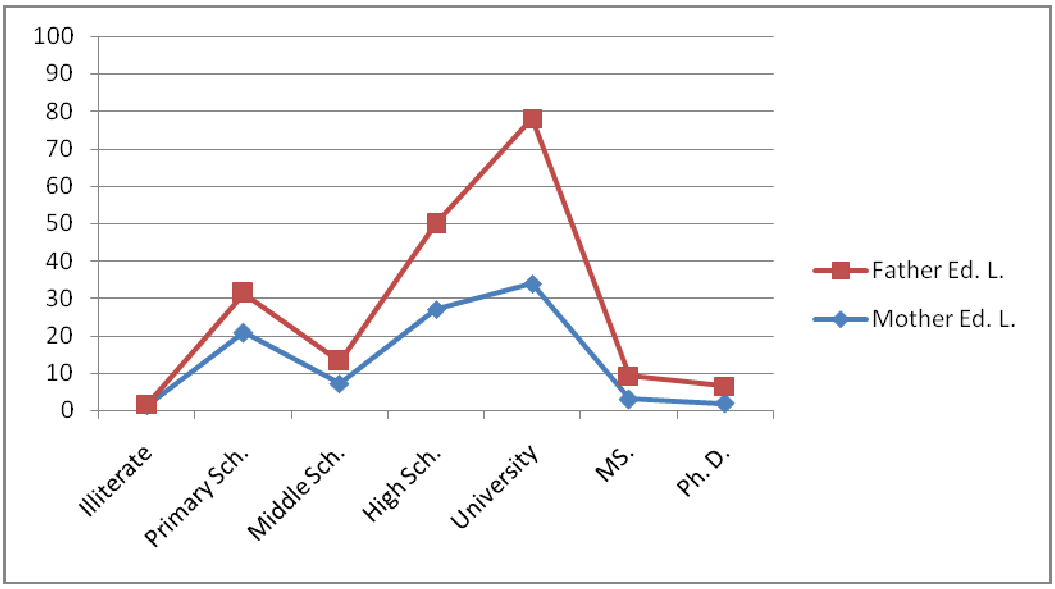

Figure 3.1 METU Students' Distribution with respect to Parents' Education Level

In line with the specified purposes in Chapter 1, another focus of the current study was to examine the sustainability-related variables for Faculty of Education students at METU. However, data collected by online web-based administration of measuring tool to METU students might not represent the characteristics of students from Faculty of Education at METU. In fact, totally 141 students from Faculty of Education filled out the online web-based measuring tool. For this reason, to obtain a representative sample of Faculty of Education students, the researcher administered the same measuring tool to these students in classroom environment.

A total of 688 students from Faculty of Education participated in the current study. The data was collected by administration of the measuring tools to the undergraduate students from the departments of Computer Education and Instructional Technologies (CEIT), Foreign Language Education (FLE), Elementary Mathematics Education (EME), Elementary Science Education (ESE), Early Childhood Education (ECE), Physics Education (PHED), Chemistry Education (CHED); and graduate students from the departments of Secondary Science and Mathematics Education (SSME), Elementary Science and

Mathematics Education (ESME), Early Childhood Education (ECE), and Educational Sciences (EDS). These respondents' distribution with respect to departments, sex, and grade level was presented in Table 3.4 and Table 3.5. Majority of respondents (N=659 (95,8%)) were enrolled in an undergraduate teacher education program, whereas a small percentage of respondents (N=29 (4,2%) were enrolled in a graduate program at Faculty of Education.

Looking at the departments of undergraduate students, the rate of participation was highest for FLE students (N=175 (26,6%)), while minimum rate of participation belonged to the students from PHED (N=44 (6,7%)). The respondents' distribution with respect to departments was consistent with the quotas of these departments. Concerning the sex of these respondents, the rate of female graduate students was higher than that of male graduate students (446 females (66,7%); 213 males (32,3%)). Regarding the grade level of these respondents, 176 (26,7%) first-grade students, 158 (24%) second-grade students, 146 (22,2%) third-grade students, 158 (24%) fourth-grade students, and 21 (3,1%) fifth-grade students participated in the current study. The departments of CEIT, FLE, EME, ESE, and ECE are four-year teacher education programs, while PHED and CHED are five-year teacher education programs. For this reason, fifth-grade students participated in the current study were only from the departments of PHED and CHED. In addition, the necessary permission in order to administer the measuring tool to first- and second-grade PHED students was not provided by the instructors of these students, so there wasn't any student from these groups participating in the present study.

Table 3.4 Undergraduate Stundets' Sampling Distribution with respect to Sex, Grade Level and Departments

	Sex		Grade Level					
Department	**Female**	**Male**	**1st**	**2nd**	**3rd**	**4th**	**5th**	**Total**
CEIT	42	80	39	21	36	26	-	**122**
	(34,4)	(65,6)	(32,0)	(17,2)	(29,5)	(21,3)		**(18,5)**
FLE	145	30	65	55	21	34	-	**175**
	(82,9)	(17,1)	(37,1)	(31,4)	(12,0)	(19,4)		**(26,6)**
EME	50	44	21	22	20	31	-	**94**
	(52,7)	(47,3)	(22,3)	(23,4)	(21,3)	(33,0)		**(14,3)**
ESE	69	14	18	22	23	20	-	**83**
	(83,1)	(16,9)	(21,7)	(26,5)	(27,7)	24,1)		**(12,6)**
ECE	83	5	25	24	19	20	-	**88**
	(94,3)	(5,7)	(28,4)	(27,2)	(21,6)	(22,7)		**(13,4)**
PHED	30	14	-	-	15	15	14	**44**
	(68,2)	(31,8)			(34,1)	(34,1)	(31,8)	**(6,7)**
CHED	27	26	8	14	12	12	7	**53**
	(50,9)	(49,1)	(15,1)	(26,4)	(22,6)	(22,6)	(13,2)	**(8,0)**
Total	**446**	**213**	**176**	**158**	**146**	**158**	**21**	**659**
	(67,7)	**(32,3)**	**(26,7)**	**(24,0)**	**(22,2)**	**(24,0)**	**(3,1)**	**(100,0)**

Concerning the respondents' distribution with respect to graduate programs at Faculty of Education, limited number of students from these programs (SSME (N=10; 34,5%); ESME (N=12; 41,4%); ECE (N=2; 6,9%); EDS (N=5; 17,2%)) participated in this study. Regarding the sex of these respondents, the rate of female graduate students was higher than that of male graduate students (21 females (72,4%); 8 males (27,6%)). Only 5 students (17,2) enrolled in a master program and 24 students (82,8%) enrolled in a doctoral program at Faculty of Education participated in the present study.

Table 3.5 Sampling Distribution of Students' Enrolled in a Graduate Program at Faculty of Education

	Sex		Grade Level		
Program	**Female**	**Male**	**M.S.**	**Ph.D.**	**Total**
SSME	8	2	-	10	**10**
	(80,0)	(20,0)		(100,0)	**(34,5)**
ESME	8	4	3	9	**12**
	(66,7)	(33,3)	(25,0)	(75,0)	**(41,4)**
ECE	2	-	2	-	**2**
	(100,0)		(100,0)		**(6,9)**
EDS	3	2	-	5	**5**
	(60,0)	(40,0)		(100,0)	**(17,2)**
Total	**21**	**8**	**5**	**24**	**29**
	(72,4)	**(27,6)**	**(17,2)**	**(82,8)**	**(100,0)**

Figure 3.2 presents the education level of these respondents' parents. Compared with the percentage of illiterate fathers (1,0%), the percentage of mothers who were illiterate was relatively large (6,2%). Approximately half of the mothers (46,8%) have attained primary school education, while nearly one quarter of fathers have attained primary school education (23,6). The rate of fathers with middle school education was 12,5%, whereas 9,9% of mothers have attained middle school education. The percentages of fathers and mothers having high school education were 22,7% and 27,2%, respectively. On the other hand, the rate of fathers attained university and higher degrees (34,2%) was greater than that of mothers attained university and higher degrees (14,3%). These frequency analysis results indicated that respondents' fathers attained higher education levels than their mothers did.

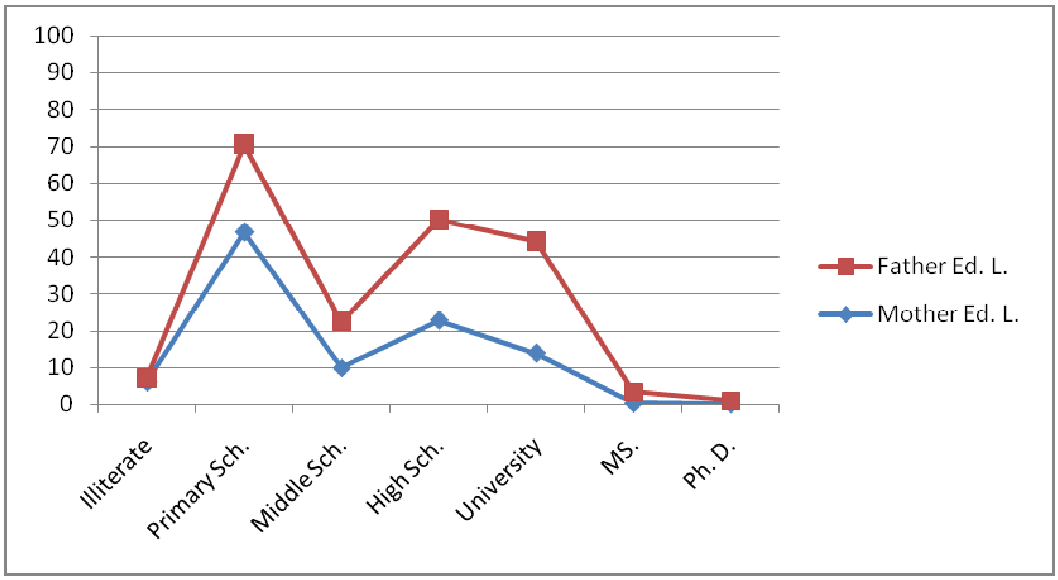

Figure 3.2 Faculty of Education Students' Distribution with respect to Parents' Education Level

3.2 Variables

In this study the variables are labeled with respect to proposed model on sustainability related concerns as exogenous variables and endogenous variables.

An exogenous variable is a variable whose variability is assumed to be determined by causes outside the causal model under consideration. In other words, there is no attempt to explain the variability of an exogenous variable or its relations with other exogenous variables. On the other hand, an endogenous is one whose variation is to be explained by exogenous and other endogenous variables in the causal model (Pedhazur, 1982, p. 178-179).

3.2.1 Exogenous Variables

In this study there are 2 exogenous variables: Sex and Tendency to Follow Media.

Sex: This variable is a nominated dichotomous variable with categories of male and female.

Tendency to Follow Media: The students' tendency to follow media is measured a 4-item scale prepared by the researcher.

3.2.2 Endogenous Variables

This study includes 4 endogenous variables: Behaviors toward Sustainable Life Styles, Attitudes toward Sustainable Development, and Values toward the Environment.

Behaviors toward Sustainable Life Styles: University students' behaviors (self-reported) toward sustainable life styles were measured by a unidimentional scale developed by Mertig (2003).

Attitudes toward Sustainable Development: Turkish version of a questionnaire prepared by Kagawa (2007) was used in order to measure university students' attitudes toward sustainable development.

Values toward the Environment: University students' values toward environment were examined by the help of sub-items used in World Values Survey (Inglehart et. al, 2002).

Activities in nature: This variable is measured by unidimentional, 5-item scale developed by National Environmental Eduation Tranining Foundation (Coyle, 2005).

3.3 Selection and Development of Measuring Tools

Regarding the primary purpose of the current study, the researcher prepared "A Questionnaire on University Students' Views of Sustainable Development" (Appendix A) that consisted of 7 dimensions on sustainable development, namely, understanding of sustainable development, attitudes toward sustainable development and its different aspects (economic, environmental, social), views on future of society, future expectations on their own life and society, behaviors toward sustainable life styles, values toward the environment, and interest in learning about sustainability issues.

Item 1, Item 3 and Item 4 are designed to determine university students' familiarity with the terms of "sustainability" or "sustainable development" and their current understandings of these terms. Item 1 and Item 4 were adopted into Turkish from "A Questionnaire on Sustainable Development" prepared by

Kagawa (2007). Item 3 in multiple-choice format is originally developed by the researcher in accordance with the different perspectives for "sustainable development" which were stated by Dresner (2002). This item provided an opportunity to evaluate whether the university students' developed an understanding of sustainable development from different political perspectives.

Item 2 and Item 6 developed by Kagawa (2007) aim to assess university students' attitudes toward sustainable development from a holistic perspective, and attitudes toward different aspects of sustainable development (economic, environmental, society). Item 6 consisted of 13 sub-items in 5-point Likert type (strongly agree, agree, undecided, disagree, strongly disagree).

Item 7 in multiple-choice format covers the statements about the future of society. This item was developed by Kagawa (2007) based on a model suggested by Robertson (1983).

Item 8 (12 sub-items) and Item 9 (6 sub-items) in rating scale (from "very important" to "not important at all") were designed by the researcher in order to determine sustainability goals for future of society and respondents' expectations for their own future life. The sub-items were prepared with respect to sustainability goals suggested in Johannesburg Declaration (WSSD, 2002). Furthermore, environmental, economic, and social aspects of sustainable development were also considered.

Behaviors toward sustainable life styles were evaluated through Item 10 covering 14 sub-items in rating scale (always, frequently, sometimes, rarely, never) which were adapted from a questionnaire prepared by Mertig (2003). Furthermore, Item 5 measuring university students' views on sustainable usage of natural resources were added in order to test whether the campus life provide the necessary opportunities and infrastructures towards sustainability.

Item 11 constituted from 9 sub-items in 5-point Likert type (strongly agree, agree, undecided, disagree, strongly disagree) was originally used in World Values Survey (Inglehart et. al, 2002). These sub-items were added to this questionnaire in order to assess university students' values toward environment.

University students' interest in learning about sustainability issues were assessed through Item 12 covering 17 sub-items in rating scale (from "very interested" to "not interested at all"). These sub-items systematically sampled major points dealing with social, economic and environmental issues threatening the sustainability of the planet. These key issues were addressed in Agenda 21 reported by Earth Summit in Rio de Janeiro (UNCED, 1992).

3.3.1 Validation of Measuring Tools

The sub-items in "A Questionnaire on University Students' Views of Sustainable Development" (QUSVSD) were carefully adapted into Turkish and wording of the statements in attitudinal sub-items were examined with respect to Edward's criteria (Crocker and Algina, 1986). For content validity concerns, the original and translated items (Item 1, Item 2, Item 4, Item 5, Item 6, Item 9, Item 10) were given to two professors from Elementary Science Education Department, one of whom was an expert on education for sustainable development. Each sub-item was evaluated and revised utilizing the responses and reactive comments of these colleagues until 90% agreement was reached among them. This helped to eliminate ambiguities in items and unfamiliar terms. Additionally, one instructor from the Department of Foreign Languages checked the adaptation of the questionnaire into Turkish before the questionnaire was piloted and implemented.

On the other hand, the items (Item 3, Item 11, Item 7, Item 8) which were originally developed by the researcher were examined by the experts on education for sustainable development. These experts checked the representativeness of these items with respect to worldwide publications on sustainable development and education for sustainable development (eg. Agenda 21, Johannesburg Declaration). The appropriateness of these items in a context of Turkish social and cultural characteristics was also considered by the committee members of this Ph.D dissertation.

The 10-item preliminary questionnaire was administered to a total of 126 Middle East Technical University students for the purpose of try out. Item 11

which aimed to assess university students' interest in learning about sustainability issues was added to QUSVSD after the pilot study had been carried out. To investigate the construct validity of the questionnaire, exploratory factor analysis was conducted in two stages; factor extraction and factor rotation (Green and Salkind, 2005). In the first stage, factor extraction was used to make an initial decision about the number of factors underlying the quantitative variables having a wide range of scores. Principle component analysis with an unrotated solution was carried out to make this decision. Based on the scree plot as a statistical criterion, it was concluded that four factors should have been rotated in the second stage of factor analysis.

In the second stage, principle component factor analysis with a varimax rotation method was conducted to make factors more meaningful. The rotated component matrix including factor loadings was presented in Appendix B.

Principle component factor analysis with a varimax rotation method results revealed that sub-items in the adapted questionnaire loaded on four factors which overlapped with the factors in the original scales. Thus, sub-items in the questionnaire represented the factors, namely; attitudes toward different aspects of sustainable development (13 sub-items), sustainability goals for future of society and their own life (18 sub-items), behaviors toward sustainable life styles (14 sub-items) and values toward environment (8 sub-items). However, 2 sub-items developed to measure students' attitudes toward different aspects of sustainable development (AttitudeF and AttitudeD) loaded on the factors of behaviors toward sustainable life styles and values toward environment, respectively. The wording of the statements belonging to these sub-items were checked and simplified by the professors from the Department of Elementary Science Education. These four factors accounted for 40.0 % of the variance in item responses and eigenvalues of these factors are all greater than 3.5 for the factor rotation trial.

In addition to factor analysis, descriptive statistics for the response distribution were also carried out for validity concerns. The relatively high frequencies of participants' responses with an "Undecided" selection were

examined in the pilot study. To be able to do revision process properly, a "debriefing" took place in which some of the participants were invited to comment on each item and offered suggestions for possible improvements of ambiguous items (Crocker and Algina, 1986). Two items developed to measure students' attitudes toward different aspects of sustainable development (AttitudeF, AttitudeI) and one item aimed to evaluate students' values toward environment (ValueF) were revised through these suggestions. Furthermore, these participants indicated that the sub-item of SGOALB (halving the rate at which the species are disappearing) was so long that it was difficult to understand it. For this reason, this sub-item was simplified to make it clear.

3.3.2 Reliability of Measuring Tools

To estimate internal consistency of the measuring tool, Cronbach's alpha for the sub-items loaded on factor of "attitudes toward different aspects of sustainable development" was calculated as 0.68, for the sub-items of "sustainability goals for future of society and their own life" factor as 0.90, for the sub-items on "behaviors toward sustainable life styles" as 0.81, and for the sub-items on "values toward environment" factor as 0.75 for the pilot study.

Cronbach's alpha values were calculated after administration of measuring tool to METU students and students at Faculty of Education. For the sample of METU students, Cronbach's alpha for the sub-items loaded on the dimension of "attitudes toward different aspects of sustainable development" was calculated as 0.71, for the sub-items of "sustainability goals for future of society and their own life" dimension as .89, for the sub-items on "behaviors toward sustainable life styles" dimension as .86, for the sub-items on "values toward environment" dimension as 0.77, and for the sub-items on "interest in learning about sustainability issues" as 0.90.

Considering the Cronbach's alpha values for the sample of Faculty of Education students, they were calculated as 0.70 for the dimension of "attitudes toward different aspects of sustainable development", as 0.83 for the sub-items on "sustainability goals for future of society and their own life", as 0.83 for the

dimension of “behaviors toward sustainable life styles”, as 0.70 for the dimension of “values toward environment”, as 0.89 for the sub-items on “interest in learning about sustainability issues”.

3.4 Procedure

Initially, this study began with the literature review in the aspect of the purpose. Educational Resources Information Center (ERIC), International Dissertations Abstracts, Ebscohost, Science Direct, Kluweronline databases, Internet (Google), dissertations and other studies done in Turkey (from Higher Education Council, studies presented in National Conferences on Science Education, Hacettepe Journal of Education) were searched by the help of a keyword list. All the articles and dissertations were read. The instruments developed by the other researchers, measuring understandings and attitudes of students toward sustainable development were obtained from the literature. These measuring instruments were administered in different countries and developed for different educational sectors. Thus, most appropriate instrument measuring understandings and attitudes of university students toward sustainable development was constituted from items by taking into consideration of environmental, economic, and social aspects in Turkey. After selection and development of measuring tool, an instrument comprising “A Questionnaire on University Students’ Views of Sustainable Development”, a demographic information part and an introductory part were prepared. The detailed information about the preparation was given in section 3.3.

Afterwards, due to possible ethical concerns, the instrument was examined by some experts at Middle East Technical University Human Research Ethics Committee (Appendix C).

The measuring tool was piloted for the purpose of try out and modified. For the main study, this online web-based questionnaire was administered to undergraduate and graduate students of Middle East Technical University during February-June of 2008. Furthermore, due to the specific purposes of the present study the same questionnaire was administered to Faculty of Education students

in classroom environment during April-May of 2008 by the researcher to obtain a representative sample. It took the participants approximately 25 minutes to fill out the questionnaire. The participant students were informed about purpose of the study. They were explained that their identity would be kept secret.

3.5 Statistical Techniques Utilized in the Study

Data file consisting of sex, the departments and the faculties, grade level, parents' educational level, and responses of participants to the measuring tool were be prepared by using SPSS in which columns show variables and rows show the participants by the researcher. The data obtained from the study was analyzed in two parts; descriptive statistics by using SPSS and inferential statistics by utilizing LISREL 8.30.

3.5.1 Descriptive Statistics

The mean and standard deviation of the variables was presented in order to show participants' attitudes toward different aspects of sustainable development, their values toward the environment and behaviors toward sustainable life styles. In addition, frequencies of participants' responses to some items such as familiarity with the terms "sustainability" or "sustainable development", keywords related to the terms "sustainability" or "sustainable development", attitudes toward sustainable development, views on future of society, future expectations on their own life, future expectations on their own life, and interest in learning sustainability issues was calculated and presented by bar graphs.

3.5.2 Inferential Statistics

For the specified purposes of the current study, path analysis was employed to determine the relationships among sustainability related variables, namely, behaviors toward sustainable life styles, attitudes toward different aspects of sustainable development, values toward the environment, activities in nature, tendency to follow media, sex.

Correlational analysis can not provide the necessary information to make clear interpretations for causal relationships and indirect relationships between the variables. In addition, multiple regression analysis was also considered inappropriate in the present study because the direction of the relationship between attitudes and values could not be defined clearly in the literature. In this aspect, path analysis was viewed as an appropriate method to test a causal model on the basis of knowledge and theoretical considerations.

3.5.3 Content Analysis

In order to analyze university students' suggestions to create a sustainable METU campus, content analysis was used. Content analysis aims to provide underlying themes and issues. Content analysis of the data began with coding it. As soon as the students' responses were gathered, the data was read again and again for accurate and appropriate analysis. The words or phrases that seemed to be important were identified. These codes addressed for this naming process was written on the margins of the data transcript. There was no pre-defined code list. All codes came out from the data, so coding was inductive. The data was analyzed word by word or line by line and within a paragraph. The codes sometimes changed for every turn back to the data. Some revisions on coding were made to label the data more understandable. The next step in analysis of the data was to find some patterns lie behind the data and codes. The codes fell into some broader categories on these patterns. Subcodes generated the major codes with respect to patterns and relations. Furthermore, the frequencies of some patterns appeared in the students' suggestions to create a sustainable METU campus were calculated.

3.6 Threats to Internal Validity

Internal validity means that *"any relationship between two or more variables should be unambiguous as to what it means rather than being due to some other unintended variable"* (Fraenkel and Wallen, 1996, p.242). Regarding

the present study, possible threats to internal validity and the strategies used to cope with them could be described as below.

Random assignment of subjects was not possible in the present study. It is plausible that the respondents in the online survey tend to be those who are more familiar with or positive attitudes towards sustainable development. Furthermore, the groups of students from Faculty of Education were already formed. Hence, some subject characteristics (sex, efficacy beliefs, socioeconomic status, locus of control, background) could be the major threat to the internal validity for the present study. Sex and tendency to follow media was considered as an exogenous variable in this study. In addition, some other characteristics of respondents such as attitudes, activities in nature and values of the students were under investigation. However, many subject characteristics not controlled in this study might explain away the endogenous variables. These characteristics (e.g efficacy beliefs, socioeconomic status, and locus of control) could be considered in further investigations.

Mortality could be another threat for internal validity of a survey research. In the present study, any respondent who failed to complete the online web-based questionnaire was excluded from the data analysis. There is not any evidence which shows that the responses of the subjects who were lost would not affect the results of the present study. For this reason, mortality threat should be considered for the online survey. On the other hand, the researcher tried to minimize the loss of subjects by communicating with the instructors for the most appropriate time to administer the questionnaire at Faculty of Education.

Location could not be regarded as a threat to survey of Faculty of Education students since the instruments were administered to all groups in similar physical arrangement of the certain classrooms and by the researcher. However, location might be a threat for the online web-based survey. The researcher could not find a chance to hold location constant. There was no accessible information on the places where the questionnaires were filled out.

Data collector characteristics and data collector bias threats were assumed to be controlled by ensuring standard procedures under which the data

were collected at Faculty of Education. Concerning the survey of METU students, data collector characteristics and data collector bias were not a threat, because this survey was not carried out by a data collector.

Finally, confidentiality was not a possible threat for this study since names of the respondents were not collected and used anywhere.

3.7 Threats to External Validity

It was suggested that "*The extent to which the results of a study can be generalized determines the external validity of the study"* (Fraenkel and Wallen, 1996, p.107). Both the nature of the sample and the environmental conditions, the settings, within which a study takes place, must be considered in generalizability.

The response rate of METU students to online survey was less 10%. At this point, the results and conclusions of the present study could not be easily applied to accessible population of METU students. However, looking at some relevant variables such as sex and faculties or graduate schools that students were enrolled in, the representatives of these characteristics makes generalization more plausible. Regarding the participation of students from Faculty of Education, it could be suggested that the results and conclusions of present study are easily applicable to the population of students from this faculty.

Since the administration procedure at Faculty of Education took place in ordinary classrooms of a public university during regular class hours. The research results may apply to classroom environments of public universities in a developing country. But, the results from the online survey of METU students may not apply to any classroom environments.

3.8 Assumptions and Limitations

The assumptions and limitations of this study considered by the researcher are given below.

3.8.1 Assumptions

- The administrations of the measuring tool were performed under standard conditions.
- The participants of the study responded to each item of the instrument sincerely.

3.8.2 Limitations

- The attitudes, values, activities in nature, tendency to follow media, and behaviors toward sustainable life styles were evaluated by the use of a self-report measure so the data might not represent the complete objectivity.
- The respondents who filled out online web-based questionnaire may not represent the population of interest.

CHAPTER 4

RESULTS

This chapter is divided into three different sections. First section deals with the descriptive statistics. The second section presents inferential statistics in which the null hypotheses are tested. Finally, the last section summarizes the findings of the study.

4.1. Descriptive Statistics for Responses of METU Students

Descriptive statistics concerning the METU students' responses on different subscales of QUSVSD were considered.

4.1.1 METU Students' Perceptions and Understandings of Sustainable Development

METU students were asked about their familiarity with the terms of "sustainable development" or "sustainability". Figure 4.1 showed that more than one-third of METU students who responded QUSVSD online (36.2%) declared themselves "very familiar" with the terms of "sustainable development" or "sustainability". Furthermore, more than one-fourth of the respondents (28.5%) identified themselves "quite familiar" with these terms. On the other hand, the rate of respondents who reported that they were either "quite unfamiliar" and "not at all familiar" with these terms were 14.4% and 20.9%, respectively.

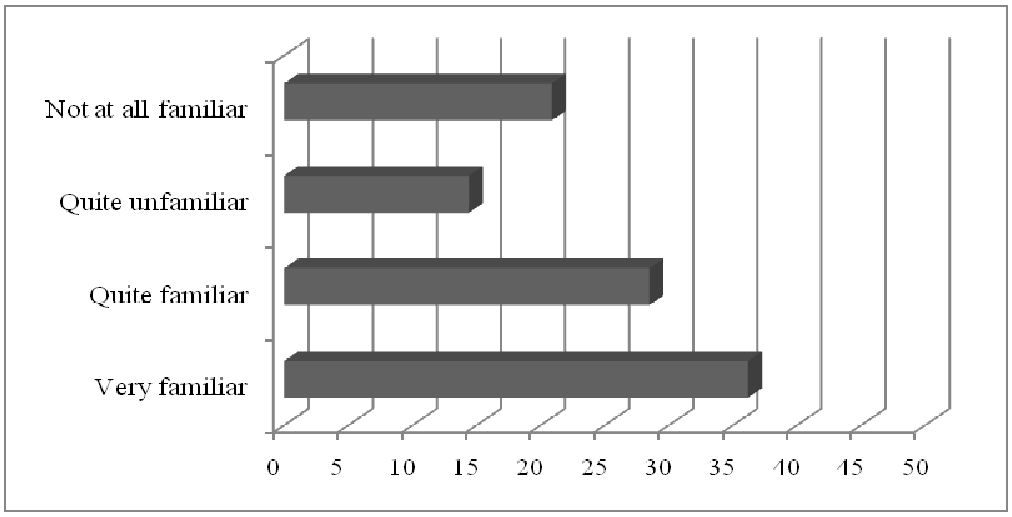

Figure 4.1 METU Students' Familiarity with the Terms of "Sustainable Development" or "Sustainability"

The respondents who identified themselves as familiar with the terms of "sustainable development" or "sustainability" were examined about their own definitions of these terms. Most of these respondents (76,3%) viewed sustainable development as "*development which meets the needs of the present without comprising the ability of future generations to meet their own needs*". On the other hand, 10,3% of these respondents defined this term as "*growth that sustain the provision of goods and services as well as the enhancement of their qualities for long term"*. The rate of respondents who identified "sustainable development" as *"development against the industrialization that aims to preserve our natural resources in order to overcome the "ecological crisis" that we face with"* was only 7,7%. A small percentage of respondents defined this term as *"economic growth which meets the needs of society for both long and short term by showing no concern for environmental protection"* (2,7%) or *"development which allows individuals to live according to their own views of good life"* (3,1%).

To gain an insight for METU students' understandings of "sustainable development" or "sustainability", the respondents were asked to write up some keywords related to these terms. The respondents suggested totally 1794 keywords which reflected their personal understandings of "sustainable development" or "sustainability". Table 4.1 presented some examples of

keywords suggested by METU students and the broader categories which these keywords fell into. These categories were outlined in the Kagawa's work (2007).

Table 4.1 Categories which the Keywords Suggested by METU Students Fell

Categories	Examples
Aspects	
Environmental	Organic food, recycle, clean energy, green, environment, biodiversity
Social	People, quality of life, social
Economic	Economy, production, trade
Temporal	
The future	Future generations, needs of future, future
Long-term	On-going, long-term, continuation
Improvement	Growth, progress, improvement
Stability	Consistent, stable
Approaches towards sustainable development/sustainability	
Governance, policy, politics	Capitalism, government
Learning and action	Awareness, education
Management	Manage, plan, prevent, control, maintain
Technology, building, and design	Technology, eco-design
Homeostasis	Balance, cycle
Human attitude	Responsibility, selfishness, ethical, well-being
Scale/Level	
Local	Local
Global/international	Worldwide
Perceptions of sustainable development/sustainability	
Feelings	Positive, necessary, impossible

Observed frequencies of these categories with respect to METU students' identifications for sustainable development/sustainability were presented in Figure 4.2. The results revealed that 46,2% of these keywords were related to environmental aspect of sustainable development and sustainability. On the other hand, social (7,8%) and economic (5,4%) aspects were only mentioned by less than one-tenth of the respondents. Similarly, observed frequencies of all other categories fall under 10 percent of the suggested keywords by METU students. The findings of this analysis reflected that METU student respondents could not develop a sound understanding of sustainable development or sustainability.

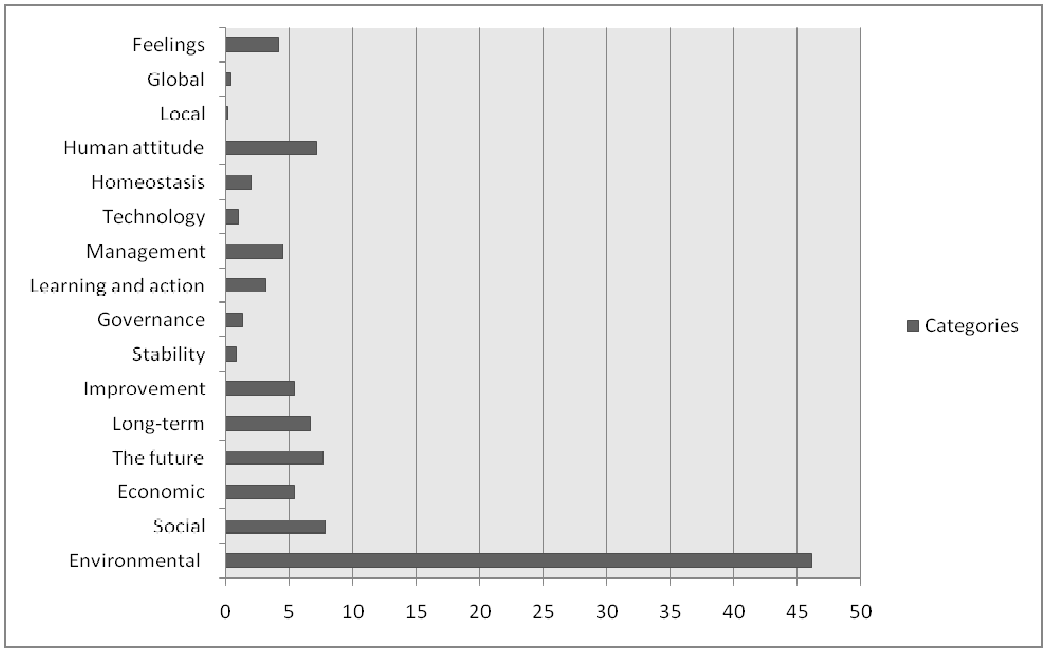

Figure 4.2 Frequency of Categories with respect to METU Students' Identifications

4.1.2 METU Students' Views on Sustainable Living at the Campus

The respondents who declared themselves as familiar with the terms of "sustainable development" or "sustainability" were also asked to evaluate METU campus life with respect to sustainable life styles. The frequency analysis showed that more than half of the respondents (62,8%) pointed out sustainable life styles

at METU campus. On the other hand, approximately one-third of the respondents (37,2%) reported that METU campus life does not support sustainable life styles.

The respondents who indicated unsustainable life styles at METU campus were asked to make some suggestions to create a more sustainable METU campus. The content analysis revealed that their suggestions represented 10 different themes on sustainable living and some examples of codes which fell into these themes were presented in Table 4.2.

Table 4.2 Categories and Some Examples of Codes toward a More Sustainable Campus by METU Students

Categories	Examples
Recycling and/reusing	Insufficient recycling bins, effective usage of recycling bins, reuse books
Transportation	Cycling, hitchhiking stops, reducing the number of private cars, environmentally sensitive public transportation
Education	'Must' courses, awareness, literacy
Energy and/or water saving	Reduce water consumption, energy saving lamps
Greening and nature conservation	Plant more trees/flowers, clean water path, do not litter
Alternative energy use	Solar energy, wind energy
Consumption patterns	Organic foods, reduce fast food consumption, healthy products
Tolerance	Right to tell ideas, respect others' beliefs
Green building designs	Eco-friendly buildings, environmental friendly materials
Economic prosperity	Job opportunities, economic investments
Political actions	Vote for student representatives

The frequencies of categories which existed in suggestions of the respondents toward a more sustainable campus life were presented in Figure 4.3. The results showed that enhancement of METU Recycling Project was the most frequently mentioned theme to create a sustainable campus life. For instance, the respondents reported that more recycling bins should be placed in shopping center, and canteens of dormitories and faculty buildings. Furthermore, they added that the students and staff should be motivated to use these recycling bins more effectively. One student wrote:

> *"I think that the vehicles and bins as the agents of recycling are insufficient. I am really very worried that the students and especially the staff are insensitive and lack of knowledge on recycling."*

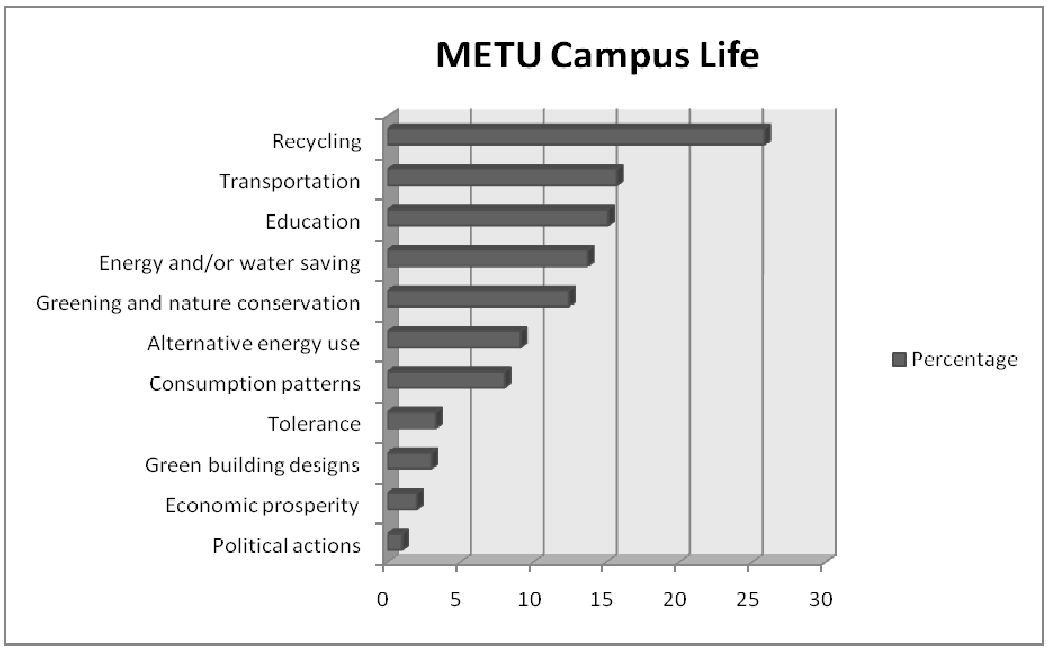

Figure 4.3 METU Students' Suggestions for a Sustainable Campus Life

According to these respondents, transportation, education, and energy and/or water saving were the other criteria which should be considered in creating a sustainable campus life at METU. To be more specific, they declared that there should be some restrictions for using private cars, hitchhiking stops might be

placed at the campus, and buses used in public transportation should be renewed for the sake of the environment. In addition, these respondents thought that the students living at METU campus did not show the necessary awareness and sensitiveness toward using energy and water efficiently. In this aspect, the respondents believed that education plays a crucial role to remove the obstacles in creating a sustainable campus. For instance, another one stated:

> *"Buses used for transportation within the campus pollute the environment and they are too old. Also, there are too many private cars in the campus. The students may be encouraged to use bicycles. Water consumption is very high in dormitories because the students are unconscious. The students do not put the lights off while leaving the classrooms."*

The respondents who reported unsustainable living at METU campus signaled their intentions to green the campus by planting trees and flowers. The responses also reflected their concern about environmental pollution and students' insensitiveness toward environmental degradation. Furthermore, these students' pointed out the necessity to use alternative energy sources such as solar energy and wind energy, and the role of new technologies on revolution of alternative energies. Changing consumption patterns was another theme that emerged as an important concern in creating a sustainable campus. For instance, one respondent declared:

> *"The students are obliged to eat fast food in shopping center, but new enterprises that will serve locally produced healthy foods may be encouraged. We can organize a festival to green the campus by planting some trees. METU has also another important mission. Since it is a technical university, it may be a pioneer in using renewable energies; wind or solar energy."*

Another one suggested:

"Environmental pollution has increased so much especially near the dormitories and stadium. The students are very insensitive. And students who have just graduated make noise pollution in celebrations, and disturb people living in dormitories and studying their lessons. Unfortunately, these new graduates think that they have right to do that. There is no safety in restaurants. University administration does not check the quality and prices of goods in canteens."

However, it appeared that there was limited number of respondents who claimed their willingness to take some political actions in administration of METU. Similarly, small percentage of respondents stated that the new constructions at METU campus should hold the infrastructures of green building designs. Furthermore, less than five-percent of these respondents pointed out that tolerance towards others' beliefs, and economic prosperity should be placed among the issues which could be taken into consideration while creating a sustainable METU campus. The following statement was belonged to a student who wrote about green buildings, and tolerance towards others' beliefs:

"In architectural designs, eco-friendly materials may be used. In human relationships, the students should learn how to communicate with each other without any violence. Also, everyone at this campus has equal rights to declare their ideas and advocate them."

One respondent who mentioned economic prosperity stated:

"Some of the students working in library were dismissed last week. The administrators told that METU has some financial problems, so they had to make some restrictions. However, it is not a really feasible solution for this problem. Since, these students working in library are the ones whose parents could not

support them financially. Indeed, the administrations have some responsibilities toward them such as providing job opportunities for poor students."

4.1.3 METU Students' Attitudes towards Sustainable Development

The respondents who declared themselves as familiar with the terms of "sustainable development" or "sustainability" were also asked about their attitudes towards sustainability. As presented in Figure 4.4, majority of these students indicated favorable attitudes towards sustainability. More than half of these respondents (58.4%) reported that sustainability is "a good thing". Furthermore, approximately one-third of these respondents (34.5%) identified themselves as "a passionate advocate" of sustainability. The rate of these respondents indicated a neutral statement of sustainability; "It is OK if others want to do it" was only 3.6%. Additionally, a small percentage of students (1.3%) reported their non-commitment towards sustainability with an agreement to the statement of "I am not really bothered". The percentage of respondents who agreed with the statement of "I think it is a waste of time and effort" was 2.2%, showing their negative attitudes towards sustainability.

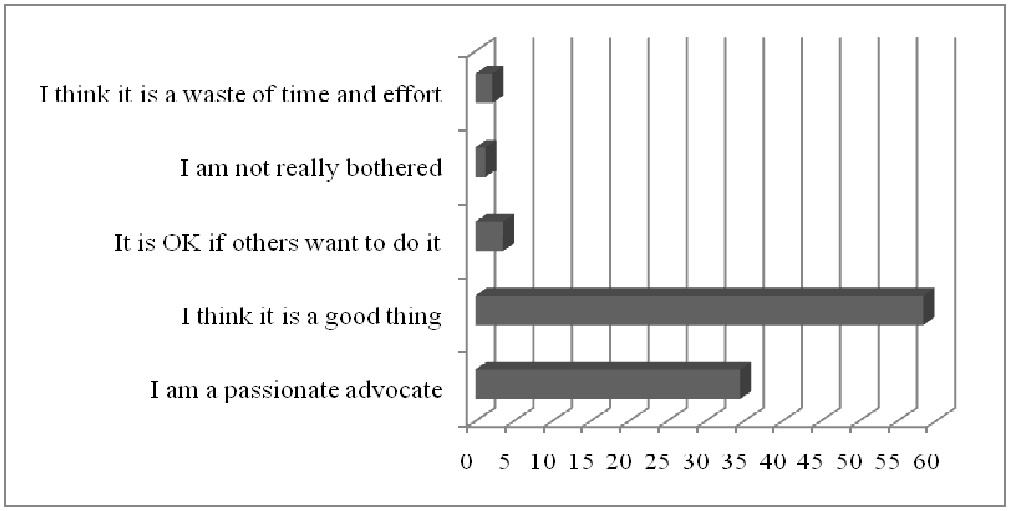

Figure 4.4 METU Students' Attitudes towards Sustainable Development

In order to determine respondents' attitudes towards different aspects of sustainability, the percentages, means, and standard deviations of METU students' responses were calculated through descriptive statistics. The mean score of 4.05 over 5 (S.D=0.41) on total subscale reflected respondents' favorable attitudes towards sustainability.

Regarding different aspects of sustainability, the mean score of 4.19 over 5 with a standard deviation of 0.59 showed that respondents developed feelings of concern on environmental deterioration and had favorable affects on environmental issues. Figure 4.5 presents the percentage of METU students' responses to attitudinal items on environmental aspect of sustainable development. Most of the respondents agreed or strongly agreed with the statement dealing with the rights of plants and non-human animals (90.9%) as well as the statement related to not buying from a company which shows no concern for the environment (87.7%). Similarly, more than 80 percent of the respondents agreed that we should change our life styles in order to offset the danger of climate change. The frequency analysis also reflected that most of the respondents were aware of the 'ecological crisis' that human beings face with (79.2%) and the fact that the natural resources are limited (71.3%).

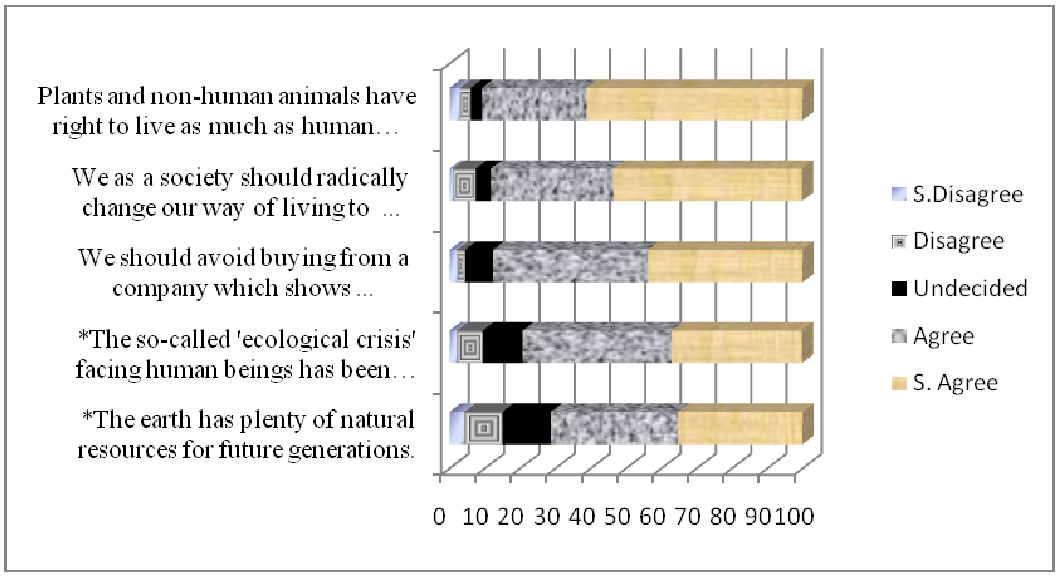

Figure 4.5 METU Students' Attitudes towards Environmental Aspect

*Reversed items

Looking at the economic aspect of sustainability, the mean score of 3.65 over 5 (S.D=0.51) reflected that these respondents could not develop strong feelings of concern toward economic aspect of sustainability issues. The percentage of METU students' responses to attitudinal items on economic aspect of sustainable development was presented in Figure 4.6. The results showed that most of the respondents (77.9%) believed contribution of environmental protection to economic growth by creating jobs, and with a similar high percentage (69.9%) they agreed with the necessity to care about using home products. In addition, majority of the respondents (80.9%) opposed to the statement that Turkey should maintain high and stable levels of economic growth, even if it disregards environmental protection. However, relatively large percentage of respondents (25.8%) was uncertain about using their own cars dependent on their economic opportunities although they agreed with making radical changes in order to offset the danger of climate change. In addition, respondents' opinions were divided when it came to decide on whether Turkey needs economic growth in order to protect the environment.

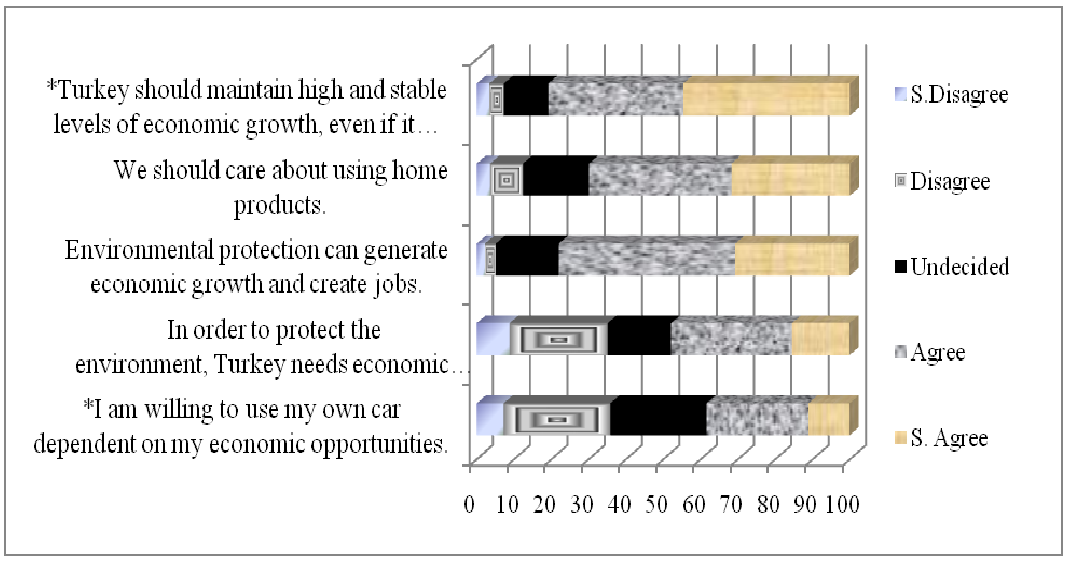

Figure 4.6 METU Students' Attitudes towards Economic Aspect

Concerning the social aspect of sustainability, the mean score of 4.48 over 5 (S.D=0.54), which was relatively higher than that of environmental and economic aspect of sustainability indicated respondents' strong desires and affects towards sustainable social life styles. Figure 4.7 presented the percentage of METU students' responses to attitudinal items on social aspect of sustainable development. More than 90 percent of respondents supported the idea that a city should ensure socially inclusive public transportation (98.2%). Similarly, majority of the respondents agreed with the statements that cultural diversity should be strongly supported (88.3%) and we should learn from cultures where people live harmoniously with nature (90.6%).

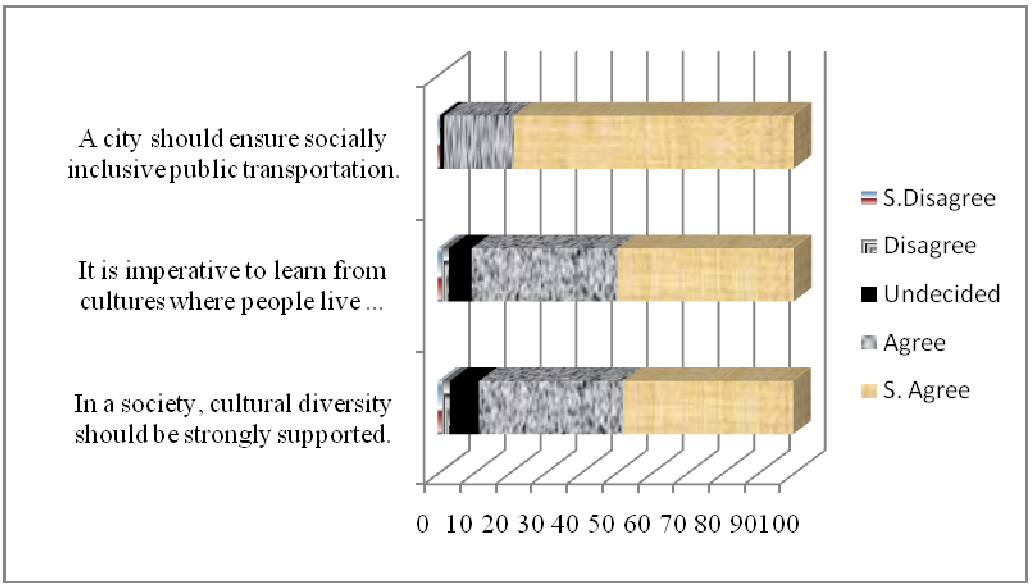

Figure 4.7 METU Students' Attitudes towards Social Aspect

4.1.4 METU Students' Environmental Values

In order to examine respondents' values toward the environment, the percentages, means, and standard deviations of METU students' responses were calculated through descriptive statistics. The mean score of 4.12 over 5 with a standard deviation of 0.55 indicated that the respondents' developed favorable intrinsic values toward the nature and did not support the dominance of human beings on nature. The frequency analysis results on environmental values were

presented in Figure 4.8. Majority of the respondents strongly agreed or agreed with the statement that humans have moral duties and obligations to other animal species (86.0%) or plants (79.9%). Furthermore, more than half of the respondents disagreed with the statement that humankind was created to rule over the nature (76.5%). With a similar large percentage (71.0%), respondents reported that we do not have the right to alter nature to satisfy wants and desires.

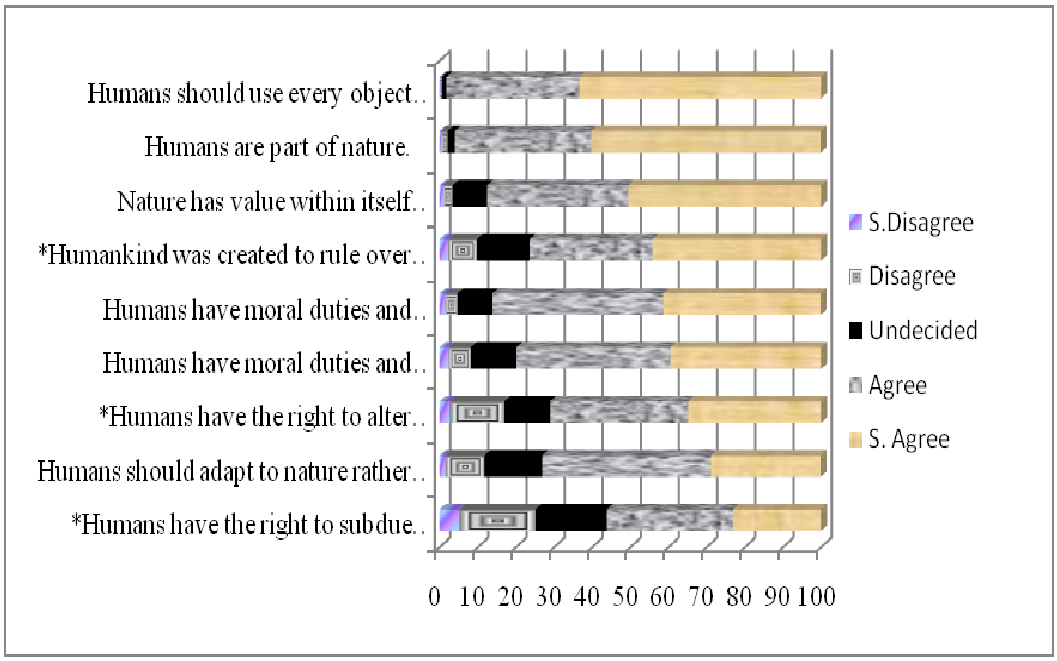

Figure 4.8 METU Students' Responses to the Items on Environmental Values

4.1.5 METU Students' Behaviors toward Sustainable Life Styles

In order to examine respondents' behaviors toward sustainable life styles, the percentages, means, and standard deviations of METU students' responses were calculated through descriptive statistics. The mean score of 3.51 over 5 with a standard deviation of 0.60 showed that respondents were not taking all the necessary actions toward a more sustainable life. Figure 4.9 shows the percentage of participants' responses on items related to their behaviors toward sustainable life styles. The results of frequency analysis reflected that the

respondents did not show the same tendencies to take the necessary actions towards different sustainability concerns. To be more specific, these students had more favorable behaviors to save energy and water, but they were not prepared to take political actions regarding environmental issues or to learn more about these issues. For instance, majority of these students' reported that they frequently or always made an effort to use less water when brushing their teeth and bathing (87.6%), while a small percentage of respondents (8.7%) declared that they frequently or always attended a protest march or demonstration for environmental reasons. In addition, only 43.5% of the respondents reported that they frequently read publications that focus on environmental problems. The results also revealed that more than half of the respondents had changed their purchasing habits by choosing locally produced foods rather than imported products (59.1%).

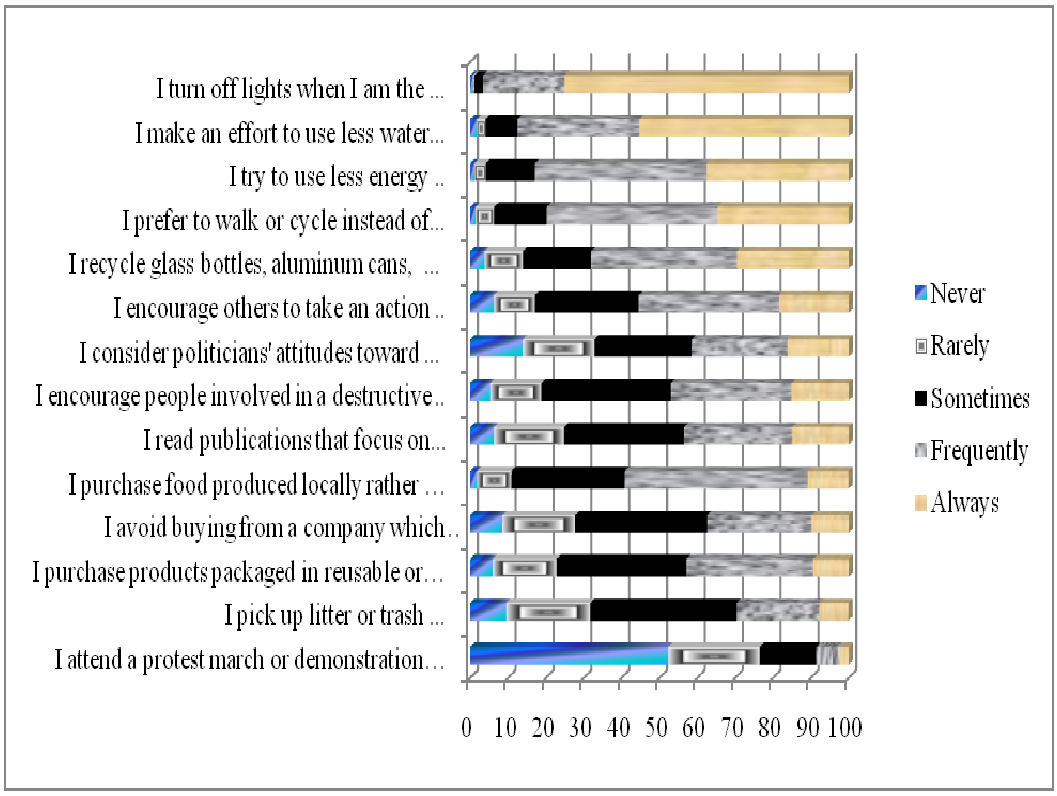

Figure 4.9 METU Students' Behaviors toward Sustainable Life Styles

4.1.6 METU Students' Views on the Future of Society

METU students reflected their views on the future of society by selecting one of the scenarios modeled by Robertson (1983). Approximately half of the respondents (40.6%) supported recent government policies about the environment, trade and social services together with a better educated youth in order to attain a better future society. As presented in Table 4.3, relatively large percentage of the respondents (26.8%) had a pessimistic point of view for the future of society reporting their concern on ecological catastrophe and collapse of our social and economic systems. About one-fifth of the respondents (21.6%) favored formation of local economies and ecological future to achieve a better future society. Relatively small percentage of the respondents (6.6%) advocated a strong authoritarian government to ensure a safe, healthy and sustainable society. On the other hand, the least selected scenario by the respondents (1.8%) was related to technological solutions for ecological problems and extreme poverty.

Table 4.3 METU Students' Views on the Future of Society

Statements	Percentage (%)
Technological progress will overcome all ecological problems we face and eliminate extreme poverty.	1.8
We are headed straight for ecological catastrophe and in my lifetime I will see the consequent collapse of our social and economic systems.	26.8
The best way forward is the formation of local economies of exchange centered around the values of smallness, justice, eco-concern and living in voluntary simplicity.	21.6
Recent government policies about the environment, trade and social services combined with a better educated youth will ensure a safe, healthy, sustainable society living within ecological limits.	40.6
Only through strong authoritarian government will we be able to establish justice and equality which will ensure a safe, healthy, sustainable society living within ecological limits.	6.6
I do not have a personal view of the future of society.	2.6

4.1.7 METU Students' Future Expectations for their Own Life

Figure 4.10 presented the importance of different statements for METU students' happiness in the next ten years. The frequency analysis results showed that having a job that makes a contribution to society was 'very important' for more than half of the respondents (533%). With a similar relatively large percentage, spending more time with family (44.0%) and spending more time in the natural environment (32.7%) were stated as 'very important' for the respondents' happiness. However, METU students participating in the present study did not declared that having a job that pays well and owning a car or a house was 'very important' for their personal happiness. On the other hand, working voluntarily for an environmental charity was not regarded as 'very important' or 'important' by the majority of the respondents for their personal happiness (57.5%).

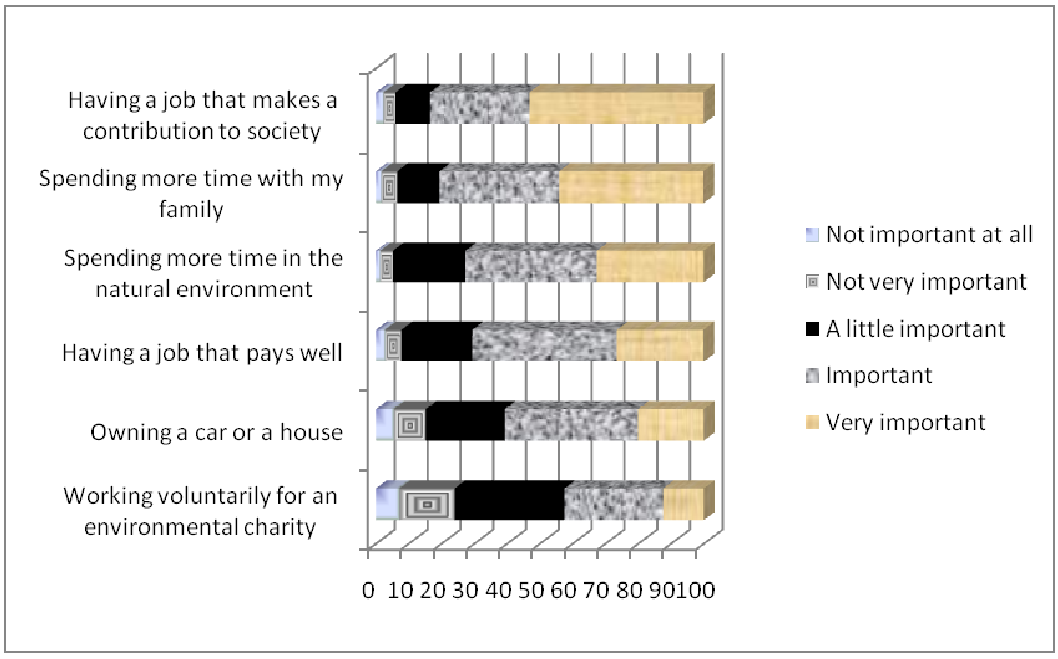

Figure 4.10 METU Students' Future Expectations for their Own Life

4.1.8 Sustainability Goals of Society Proposed by METU Students

The respondents were asked to rate the importance of statements related to possible sustainability goals of a society. The results of the frequency analysis

(Figure 4.11) showed that METU students participated in the current study advocated the importance of these sustainability goals for their own society. However, it seemed that some of these sustainability goals have a priority for METU students. For instance, large percentages of respondents believed that more emphasis on education (88.6%), attainment of health services for everyone (85.8%), administration of water resources and enhancement of water usage efficiency (74.5%), struggling with poverty (74.0%) were 'very important' for their own society. However, less than half of the respondents reported supplying the necessary opportunities for economic investments (38.0%), conservation of biological diversity (47.5%), respect for cultural diversity (48.3%) as 'very important' for the development of society.

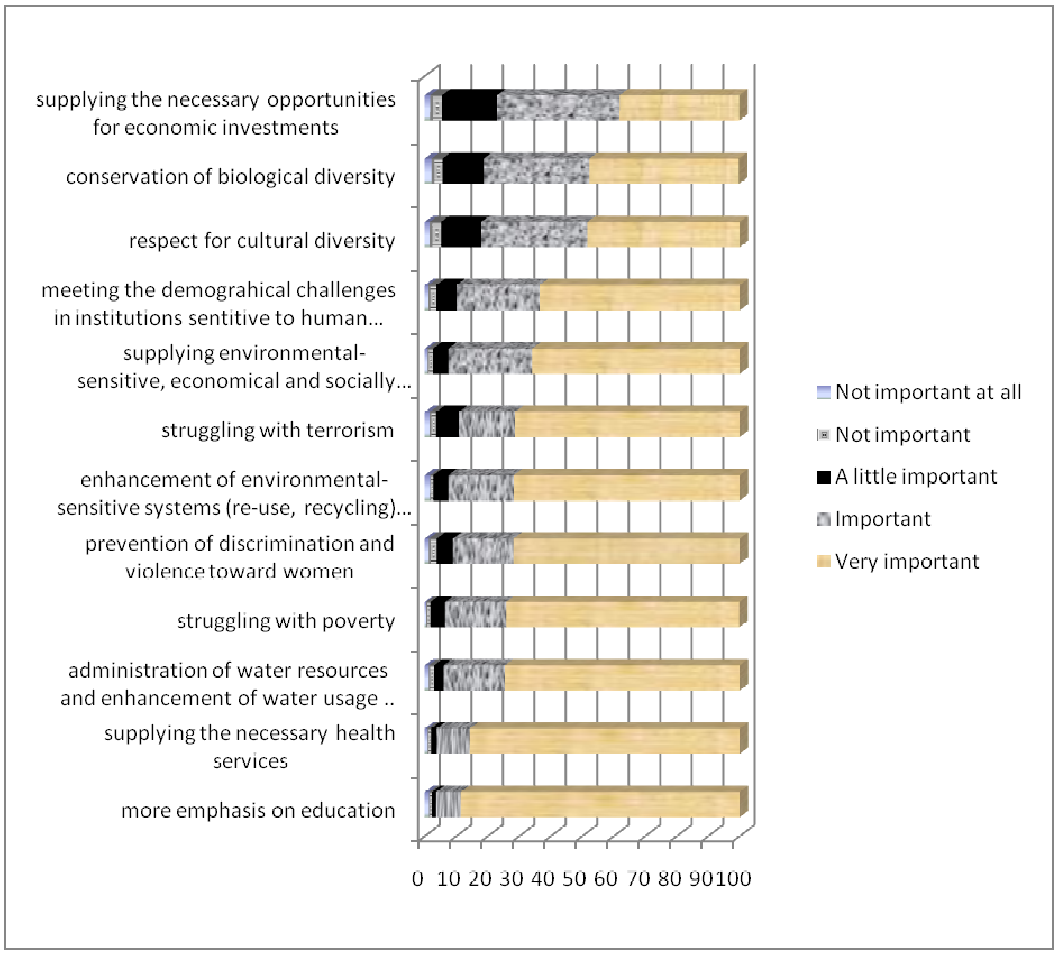

Figure 4.11 Percentage of METU Students' Responses on Sustainability Goals of Society

4.1.9 METU Students' Interest in Learning about Sustainability Issues

METU students participated in the current study were asked to rate their own interest in learning about some issues related sustainability. The results of the frequency analysis (Figure 4.12) showed that more than half of the respondents were 'very interested' or 'interested' in learning more about these issues. However, it appeared that the respondents held higher willingness to learn some of these issues. To be more specific, relatively large percentages of respondents declared themselves as 'very interested' in learning about alternative energy resources (53.3%), our personal responsibilities (52.0%), conservation and management of water resources (50.3%). On the other hand, chemical wastes (21.9%), solid wastes and radioactive wastes (29.1%) organic farming (30.3%) were among the issues that they were relatively less interested in.

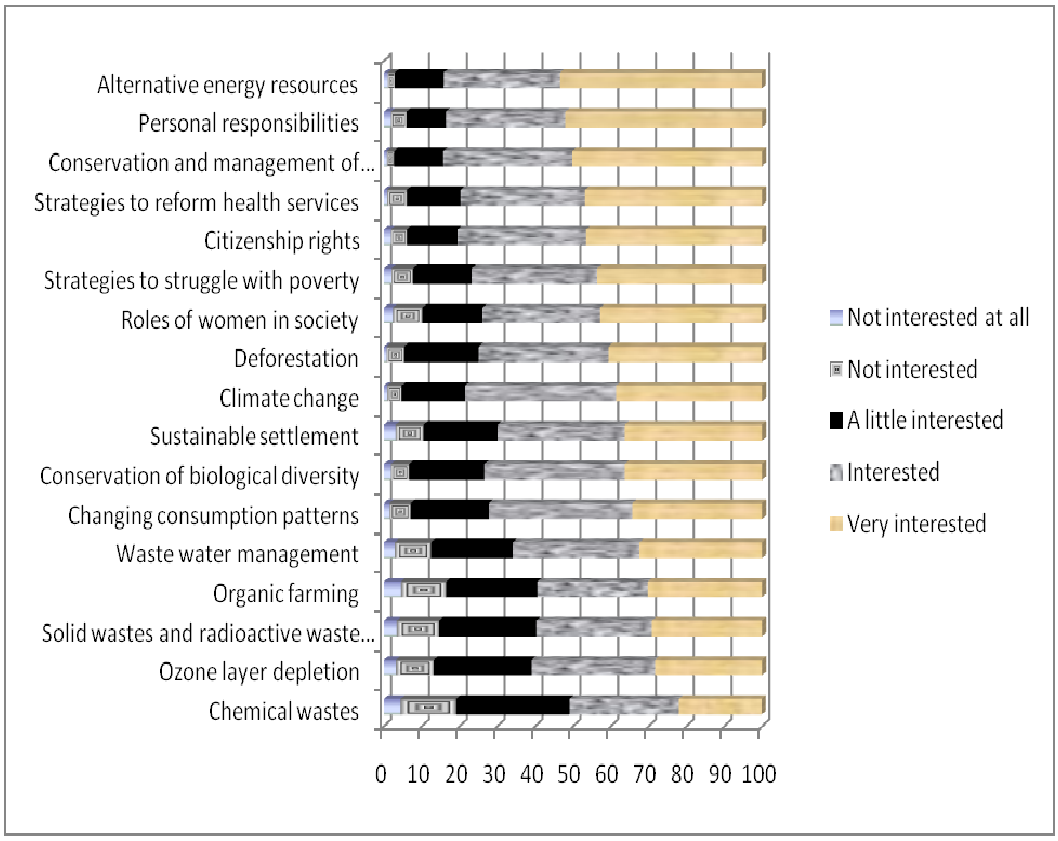

Figure 4.12 METU Students' Interest in Learning about Sustainability Issues

4.2 Results Concerning Relationships among Variables of METU Students' Sustainability Concern

In order to examine the relationships among variables of METU students' sustainability concern, at the first stage factor analysis was conducted on the basis of related subscales (APPENDIX D). The observed variables representing the latent variables that would be included in the structural equation modeling were determined by using two criteria. First, the minimum three observed variables were used and second, items with greater factor loadings were selected to generate each latent variable (Schumacher & Lomax, 1996). The first latent variable was related to respondents' behaviors toward sustainable life styles where *'I read publications that focus on environmental issues', 'I encourage people involved in a destructive environmental behavior to stop that activity'*, and *'I consider politicians' attitudes toward resolution of environmental problems when voting or supporting'* were the items that constituted this latent variable. The second latent variable was respondents' values toward the environment. The items that generated this latent variable were *'Humans have the right to alter nature to satisfy wants and desires', 'Humans have the right to subdue and control nature'*, and *'Humans should adapt to nature rather than modify it to suit them'*. Another latent variable was related to respondents' attitudes toward different aspects of sustainable development which was constituted by the items of *'The so-called 'ecological crisis' facing human beings has been greatly exaggerated', 'Turkey should maintain high and stable levels of economic growth, even if it disregards the environment'*, and *'It is imperative to learn from cultures where people live harmoniously with nature'*. The fourth latent variable was respondents' tendency to read or watch media. The items of *'newspaper', 'documentary'*, and *'news on TV'* constituted this latent variable. The last latent variable was activities performed in nature where *'camping', 'walking'*, and *'fishing'* were the items that generated the latent variable.

The data file containing all the included observed variables was organized and imported into PRELIS 2.30 for Windows. After the data file was imported into PRELIS 2.30 for Windows and the necessary steps were acquired,

LISREL 8.30 for Windows with SIMPLIS command language was conducted for formulating and estimating the structural equation models of METU students who participated in the current study. The structural equation modeling analysis was conducted by using the listwise deletion method in missing values analyses and the method Maximum Likelihood in modeling analysis. Moreover, in all the analyses, significance level of 0.05 is used.

Firstly, the theoretical model presented in Chapter 1 was tested with METU students participated in the current study. Later, the following non-significant paths were deleted from the model.

When the Null Hypothesis, *'The path coefficient from sex to METU students' behaviors toward sustainable life styles is not significant'* was tested, it was observed that the calculated path coefficient of -0.14 was not significant with a t-value of -1,73. For this reason, this null hypothesis was failed to reject.

Testing the Null Hypothesis, '*The path coefficient from media to METU students' environmental values is not significant'* revealed that the path coefficient of 0,05 was not significant with a t-value of 0.95. As a result, this null hypothesis was failed to reject.

The paths from the latent variable Attitudes to Activities and from Activities to Values were constructed on the basis of the modification indexes. Later on, four covariance terms were added to the SIMPLIS syntax in order to improve the model considering the highest meaningful modification indices. The final SIMPLIS syntax for METU students' sustainability concerns can be found in the APPENDIX E. LISREL estimates of parameters in structural model of METU students in which the coefficients were in standardized values was presented in Figure 4.13. Moreover, the Figure 4.14 displayed LISREL estimates of parameters in structural model of METU students in which the coefficients were in t-values.

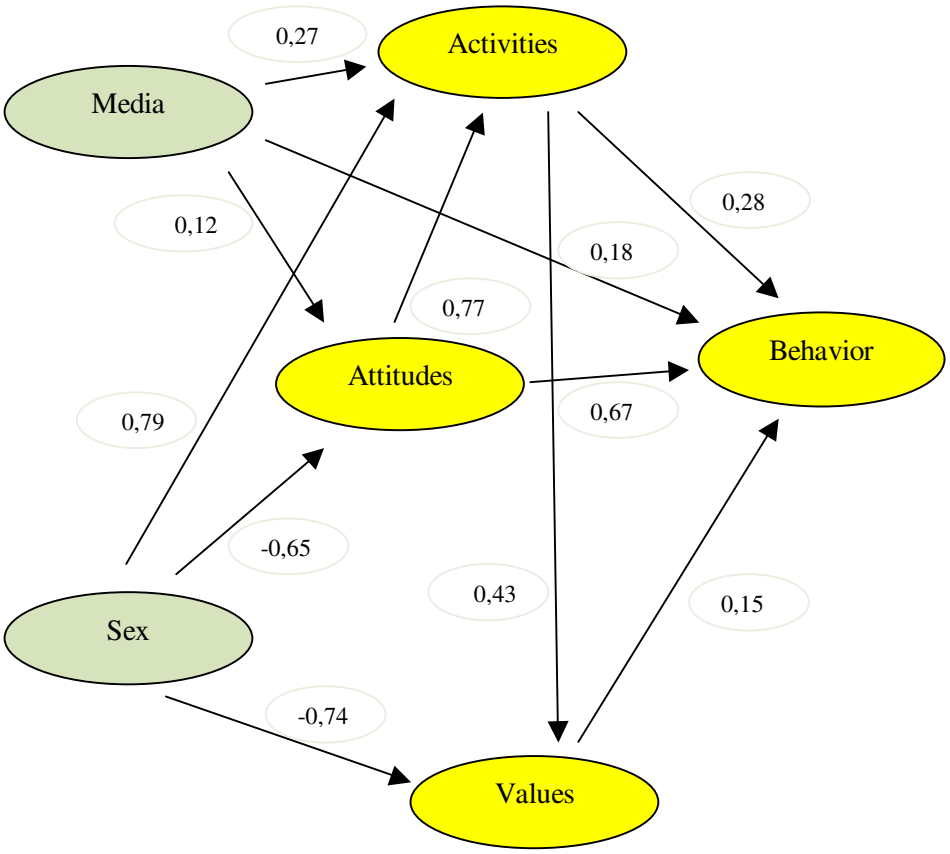

Figure 4.13 LISREL Estimates of Parameters in Structural Model of METU Students (Coefficients of Standardized Value)

As it was shown in Figure 4.13 and Figure 4.14, the structural equation model of METU students' sustainability concerns was consisted of two latent exogenous variables and four latent endogenous variables. The latent exogenous variables were 'Tendency to Read or Watch Media' (Media) and Sex (Sex), while the latent endogenous variables were 'Attitudes towards Different Aspects of Sustainable Development' (Attitudes), 'Values toward the Environment' (Values), 'Behaviors toward Sustainable Life Styles' (Behavior), and 'Activities Performed in Nature' (Activities).

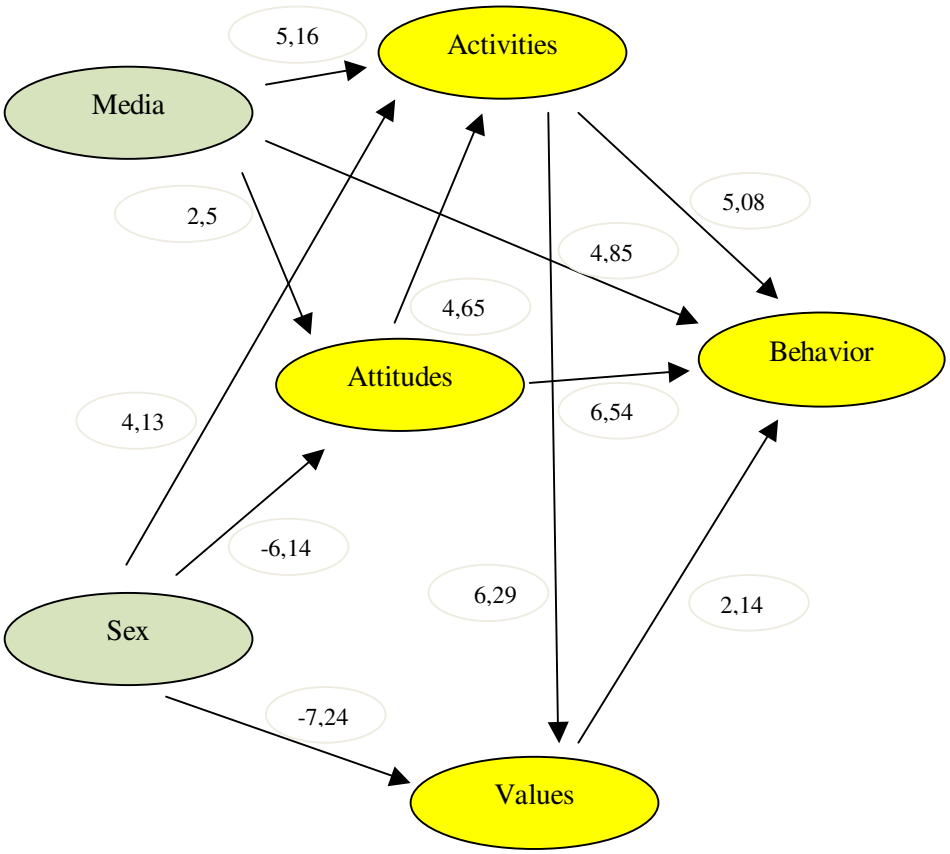

Figure 4.14 LISREL Estimates of Parameters in Structural Model of METU Students (Coefficients in T-Values)

The relationships between the latent variables and the observed variables were indicated by the measurement coefficients of the λ_y (lowercase lambda sub y) and the λ_x (lowercase lambda sub x) values. Furthermore, the ε (lowercase epsilon) and δ (lowercase delta) are the measurement errors for the Ys and Xs, respectively. Table 4.4 presented these measurement coefficients in standardized values for METU students' sustainability concerns.

Table 4.4 Measurement Coefficients of METU Students' Sustainability Concerns

Observed Variables	λ	Latent Variables	Measurement Error
AttitudeC	0.54 (λ_y)		0.71 (ε)
AttitudeH	0.52 (λ_y)	Attitudes	0.73 (ε)
AttitudeL	0.51 (λ_y)		0.74 (ε)
ValueA	0.82 (λ_y)		0.33 (ε)
ValueE	0.78 (λ_y)	Values	0.39 (ε)
ValueC	0.35 (λ_y)		0.63 (ε)
BehK	0.69 (λ_y)		0.52 (ε)
BehL	0.84 (λ_y)	Behavior	0.30 (ε)
BehN	0.69 (λ_y)		0.53 (ε)
Camp	0.26 (λ_y)		0.73 (ε)
Walk	0.89 (λ_y)	Activities	0.31 (ε)
Fish	0.64 (λ_y)		0.51 (ε)
Gender	0.50 (λ_x)	Sex	0.75 (δ)
Documentary	0.81 (λ_x)		0.35 (δ)
News	0.64 (λ_x)	Media	0.42 (δ)
Newspaper	0.70 (λ_x)		0.52 (δ)

Regarding the strength and direction of the relationships, the structure coefficients of the γ (lowercase gamma) and the β (lowercase beta) were considered. The values of γ (lowercase gamma) indicate the strength and direction of the relationships among the latent endogenous and latent exogenous variables. Moreover, the values of β (lowercase beta) represent the strength and direction of the relationships among the latent endogenous variables. The

structure coefficients of γ and β for METU students' sustainability concerns which were displayed in standardized values were presented in Table 4.5.

Table 4.5 The Structure Coefficients of γ and β for the Model

Latent variables		**β**	**γ**	***T***
Activities &	Attitudes	0.77	-	4.65
Values &	Activities	0.43	-	6.29
Behavior &	Attitudes	0.67	-	6.54
	Activities	0.28	-	5.08
	Values	0.15	-	2.14
Media &	Attitudes	-	0.12	2.50
	Activities	-	0.27	5.16
	Behavior	-	0.18	4.85
Sex &	Attitudes	-	0.65	6.14
	Activities	-	0.79	4.13
	Values	-	-0.74	-7.24

The results presented in Figure 4.13 further displayed the direct effects of the latent exogenous variables on the latent endogenous variables. However, LISREL output of the structural model also provided the indirect effects and the total effects of latent exogenous variables on latent endogenous variables. The values of the indirect effects and total effects of latent exogenous variables on latent endogenous variables were presented in Table 4.6 and Table 4.7.

Table 4.6 Indirect Effects of Latent Exogenous Variables on Latent Endogenous Variables for METU Students Structural Model

Endogenous Variables	Exogenous Variables	
	Media	Sex
Attitudes	-	-
Values	0.16	0.12
Activities	0.09	-0.51
Behavior	0.16	-0.26

Table 4.7 Total Effects of Latent Exogenous Variables on Latent Endogenous Variables for METU Students Structural Model

Endogenous Variables	Exogenous Variables	
	Media	Sex
Attitudes	0.12	-0.65
Values	0.16	-0.62
Activities	0.37	0.28
Behavior	0.34	-0.26

The results presented in Figure 4.13 further showed that Media had a positive direct relationship with Attitudes ($\Gamma = 0.12$, $p < 0.05$). Furthermore, Sex had a negative direct relationship with Attitudes ($\Gamma = -0.65$, $p < 0.05$). However, indirect effects of Sex and Media on Attitudes did not found.

Since the latent exogenous variable Media did not have any direct relationship with Values, the indirect effect of this variable on Values was investigated. Media had significant positive indirect relationship with Values ($\Gamma = 0.16$, $p < 0.05$). The latent exogenous variable Sex had a significant and negative direct relationship with Values ($\Gamma=-0.74$, $p < 0.05$). Sex also had a significant, but positive relationship with Values ($\Gamma=0.12$, $p < 0.05$).

The latent exogenous variables of Media and Sex had significant and positive effects on Activities (Γ=0.27, $p < 0.05$; Γ=0.79, $p < 0.05$, respectively). These variables had also significant indirect effects on Activities, but the indirect effect of Sex was negative (Γ=0.09, $p < 0.05$; Γ= -0.51, $p < 0.05$, respectively).

The latent exogenous variable of Sex did not have a direct relationship with Behavior, so indirect effect of this variable should be considered. Sex was reported to have a significant and negative relationship with Behavior (Γ= -0.26, $p < 0.05$). Media had a significant and positive direct (Γ= 0.18, $p < 0.05$) and (Γ= 0.16, $p < 0.05$) indirect effects on Behavior.

The LISREL results presented in Figure 4.13 further displayed the direct effects between the latent endogenous variables. The values of the indirect effects and total effects between latent endogenous variables provided by the LISREL output were presented in Table 4.8 and Table 4.9.

Table 4.8 Indirect Effects between Latent Endogenous Variables for METU Students Structural Model

	Attitudes	Values	Activities	Behaviors
Attitudes	-	-	-	-
Values	0.33	-	-	-
Activities	-	-	-	-
Behavior	0.16	-	0.07	-

Table 4.9 Total Effects between Latent Endogenous Variables for METU Students Structural Model

	Attitudes	Values	Activities	Behaviors
Attitudes	-	-	-	-
Values	0.33	-	0.43	-
Activities	0.77	-	-	-
Behavior	0.83	0.15	0.21	-

The latent endogenous variables did not have any direct and indirect effects on the latent endogenous variable Attitudes. On the other hand, Attitudes had direct effects on Activities ($\beta = 0.77$, $p < 0.05$).

The latent endogenous variable Activities had a positive and significant direct effect of 0.43 ($p < 0.05$) on Values. Attitudes did not have a significant direct relationship with Values, but the results indicated a significant indirect effect of Attitudes on Values ($\beta = 0.33$, $p < 0.05$)

The latent endogenous variable Activities had a positive and significant direct effect of 0.28 on Behavior ($p < 0.05$) and a positive significant indirect effect of 0.07 ($p < 0.05$) on Behavior. The LISREL results also indicated significant both direct and indirect effects of Attitudes on Behavior ($\beta = 0.67$, $p < 0.05$; $\beta = 0.16$, $p < 0.05$, respectively). The latent endogenous variable Values had a positive and significant direct relationship with Behavior ($\beta = 0.15$, $p < 0.05$).

The structural model of METU students' sustainability concerns was evaluated with respect to the goodness-of-fit indices. The critical values of the goodness-of-fit statistics which were used in the present study can be summarized as in Table 4.10.

Table 4.10 Goodness-of-Fit Statistics

GOF Statistics	Values Indicating Fitness to Data
Chi-Square	Non-significant
Normed Chi-Square (NC)	< 5.00*
Root-Mean-Square Error (RMSEA)	< 0.05**
Root-Mean Square Residual (RMR)	< 0.05*
Goodness of Fit Index (GFI)	> 0.90*
Adjusted Goodness-of-Fit Index (AGFI)	> 0.90*
Comparative Fit Index (CFI)	> 0.90***

* Kelloway (1998)
** Steiger (1990)
*** Bentler (1990)

The Chi-Square, χ^2 = 303.47, was significant with degrees of freedom, df=73, and the significance level, p = 0.000. But, the χ^2 criterion was reported to have a tendency showing a significant probability level as the sample size increases, generally above 200 (Schumacker & Lomax, 1996). The sample size for METU students was 958; therefore, a significant test statistic was obtained with this large sample. Furthermore, the Normed Chi-Square (NC), which was calculated by χ^2/df, of the model for METU sample was 4,16 which was less than 5 indicating a good fit to the data (Kelloway, 1998).

The Goodness-of-Fit Index (GFI) and the Adjusted Goodness-of-Fit Index (AGFI) of the structural model for METU students were 0.96 and 0.93, respectively. Since these values were approaching to unity, the model had a good fit to the data.

The Root-Mean-Square Residual (RMR) of the model was 0.043. The value of RMR showed a good fit to the data since the value was less than 0.05. Another criterion for goodness-of-fit, the Root-Mean-Squared Error of Approximation (RMSEA) of the model was 0.057. This value of RMSEA did not indicate a good fit to the data. However, RMSEA of the model was in the 90 percent confidence interval for RMSEA which was from 0.051 to 0.064.

The Comparative Fit Index (CFI) of the structural model for METU students was 0.93. Since this value was approaching unity, it indicated a good fit of the model to the data.

Another criterion used to decide on the fitness of model to the data was Expected Cross Validation Index (ECVI). The value of ECVI for the structural model of METU students was 0.41. The ECVI of the model was contained in the 90 percent confidence interval for ECVI which was from 0.36 to 0,47. The confidence interval for the estimate of ECVI was also reported by LISREL. Since the ECVI value of the model was between the values of the confidence interval, it could be declared that the model indicated a good fit to the data.

In conclusion, some goodness-of-fit indices of the structural model were examined through their criteria and it was found that the model for METU

students showed a good fit to the data. Thus, all the indicators except for RMSEA suggested an overall fit between the structural model and the observed data.

4.2.1 Effect Sizes for the Structural Model of METU Students' Sustainability Concerns

In the current study, the magnitude of an exogenous variable's effect, in other words, a proportion of explained variance in endogenous variables was considered. Weinfurt (1995) called the magnitude of an exogenous variable's effect as 'effect size'. A squared multiple correlation (R^2) index was used to measure the effect size. This index assesses how well the linear combination of predictor variables in the regression analysis predicts the criterion variable. The classification of effect sizes of Cohen (1977) has become somewhat of a standard in social research. The proper standard classification scheme should be the one Cohen suggested for effect sizes measured in terms of R^2. The classification scheme indicates such indices for effect sizes: 0.01 is small, 0.09 is medium and 0.25 or greater is large. Table 4.11 presented R^2 values calculated by LISREL for the structural model of METU students' sustainability concerns

Table 4.11 Effect Sizes of the Model for METU Students' Sustainability Concerns

Latent Variables	Squared Multiple Correlations (R^2)
Attitudes	0.48
Values	0.62
Activities	0.47
Behavior	0.62

For METU students, the attitudes towards different aspects of sustainable development had an effect size value of 0.48, the activities performed in nature had an effect size of 0.47, and both the values toward the environment and the behaviors toward sustainable life styles had an effect size of 0.62 which

could be declared as large because these effect size measures were greater than the large index 0.25. In conclusion, the included predictor variables explained 48% of the variance of attitudes towards different aspects of sustainable development; 47% of the variance of the activities performed in nature; and 62% of the variance of each the values toward the environment and the behaviors toward sustainable life styles.

4.3 Descriptive Statistics for Responses of Students from Faculty of Education

Descriptive statistics concerning the Faculty of Education students' responses on different subscales of QUSVSD were considered.

4.3.1 Faculty of Education Students' Perceptions and Understandings of Sustainable Development

Faculty of Education students were asked about their familiarity with the terms of "sustainable development" or "sustainability". Figure 4.15 showed that more than one-fifth of Faculty of Education students who responded QUSVSD online (22.4%) declared themselves "very familiar" with the terms of "sustainable development" or "sustainability". Furthermore, nearly one-third of the respondents (29.3%) identified themselves "quite familiar" with these terms. On the other hand, the rates of respondents who reported that they were either "quite unfamiliar" or "not at all familiar" with these terms were 22.2% and 26.0%, respectively.

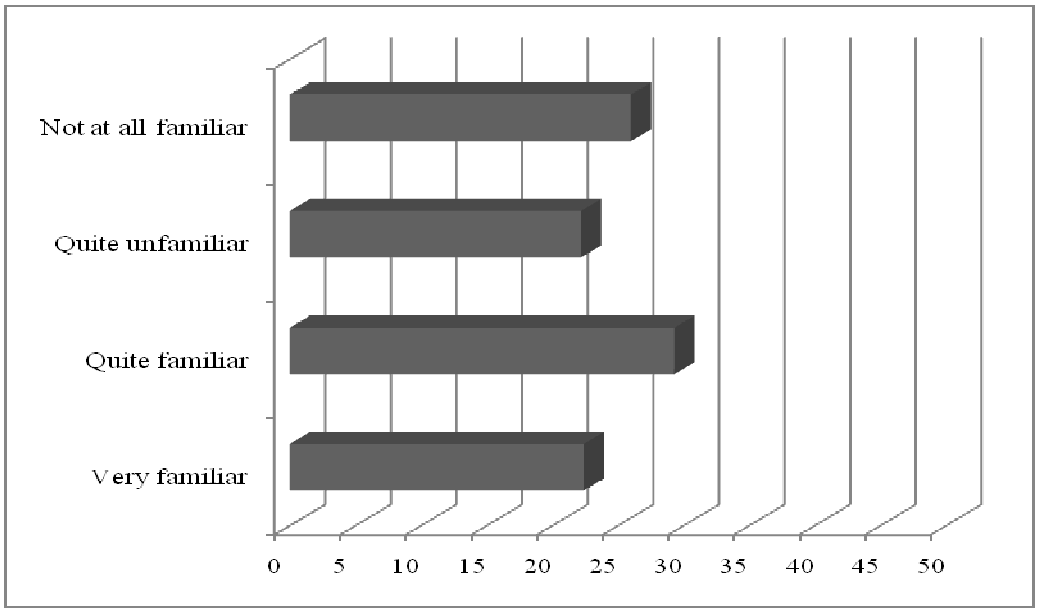

Figure 4.15 Faculty of Education Students' Familiarity with the Terms of "Sustainable Development" or "Sustainability"

The respondents who identified themselves as familiar with the terms of "sustainable development" or "sustainability" were examined about their own definitions of these terms. Most of these respondents (70.5%) viewed sustainable development as "*development which meets the needs of the present without comprising the ability of future generations to meet their own needs*". On the other hand, 10.7% of these respondents defined this term as "*development against the industrialization that aims to preserve our natural resources in order to overcome the "ecological crisis" that we face with"*. The rate of respondents who identified "sustainable development" as *"growth that sustain the provision of goods and services as well as the enhancement of their qualities for long term"* was 7.9%. Similarly, a small percentage of respondents defined this term as *"economic growth which meets the needs of society for both long and short term by showing no concern for environmental protection"* (3.3%) or *"development which allows individuals to live according to their own views of good life"* (7.6%).

To examine Faculty of Education students' understandings of "sustainable development" or "sustainability" in a broader context, these

respondents were asked to write up some keywords related to these terms. There were totally 1016 keywords which showed their personal understandings of "sustainable development" or "sustainability". In data analysis, the categorization outlined in Table 4.1 was used.

The frequencies of these categories observed in Faculty of Education students' reports for sustainable development/sustainability were presented in Figure 4.16. The results showed that 47.8% of these keywords were associated with environmental aspect of sustainable development and sustainability. However, small percentage of respondents reflected social (7.7%) and economic (5.6%) aspects of these terms. Similarly, the frequencies of all other categories fall under 10 percent of the responses by Faculty of Education students. The findings of this study indicated that Faculty of Education students could not develop an adequate knowledge base on sustainable development or sustainability.

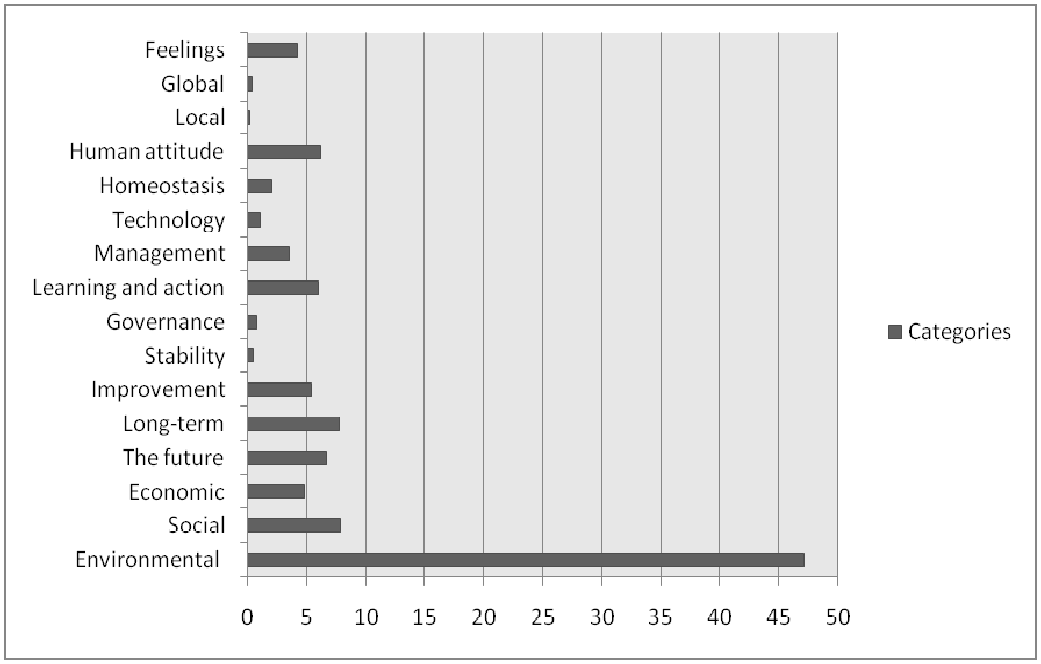

Figure 4.16 Frequency of Categories with respect to Faculty of Education Students' Identifications

4.3.2 Faculty of Education Students' Views on Sustainable Living at the Campus

At Faculty of Education, the respondents who declared themselves as familiar with the terms of "sustainable development" or "sustainability" were also asked to evaluate METU campus life with respect to sustainable life styles. The frequency analysis showed that more than half of the respondents (80.8%) pointed out sustainable living at METU campus. On the other hand, approximately one-fifth of the respondents (19.2%) reported that METU campus life does not support sustainability.

The respondents who indicated unsustainable life styles at METU campus were also asked to make some suggestions to create a more sustainable METU campus. However, less than half these respondents (38.6%) wrote some suggestions on how to create a sustainable METU campus. The content analysis indicated that these suggestions represented 8 different themes on sustainable living. Some examples of codes which were presented in Table 4.12 generated these themes.

Table 4.12 Categories and Some Examples of Codes toward a More Sustainable Campus by Faculty of Education Students

Categories	Examples
Recycling	Insufficient recycling bins, effective usage of recycling bins
Transportation	Cycling, reducing the number of private cars
Education	Extra courses on sustainability
Energy and/or water saving	Reduce water consumption, energy saving lamps
Greening and nature conservation	Plant more trees,
Alternative energy use	Solar energy, wind energy
Consumption patterns	Healthy foods, high quality foods
Economic prosperity	Financial support

The frequencies of themes which existed in suggestions of Faculty of Education students toward a more sustainable campus life were presented in Figure 4.17. As it was observed in METU students' data, enhancement of METU Recycling Project was the most frequently mentioned theme to create a sustainable campus life by Faculty of Education students. For instance, the respondents reported that more recycling bins should be placed at the campus, and students as well as the stuff should be encouraged to use these bins. Furthermore, they added that education plays a crucial role in successful implementation of recycling project. One student wrote:

> *"I think the number of recycling bins is not sufficient. Moreover, staff and students should be well educated in using recycling bins."*

The results also revealed that Faculty of Education students who were worried about unsustainable living at METU campus had willingness to save more energy and/or water. For instance, one student pointed out:

> *"We should be more sensitive in using water and electrical energy. Our water resources are getting scarce, so the students and the staff must be encouraged to save water. Some panel discussions or brochures hung up in dormitories and faculty buildings may be useful."*

However, small percentage of the respondents suggested transportation, alternative energy use, changing consumption patterns, greening and nature conservation, and economic prosperity as the criteria which should be taken into consideration in creating a sustainable campus life at METU. To be more specific, there was limited number of respondents who reflected using new technologies of solar energy at METU campus, reducing the number of private cars, healthy foods, and providing some job opportunities for students having financial problems. Similarly, the themes of green building designs, and tolerance towards

others' beliefs were not appeared in the responses of Faculty of Education students.

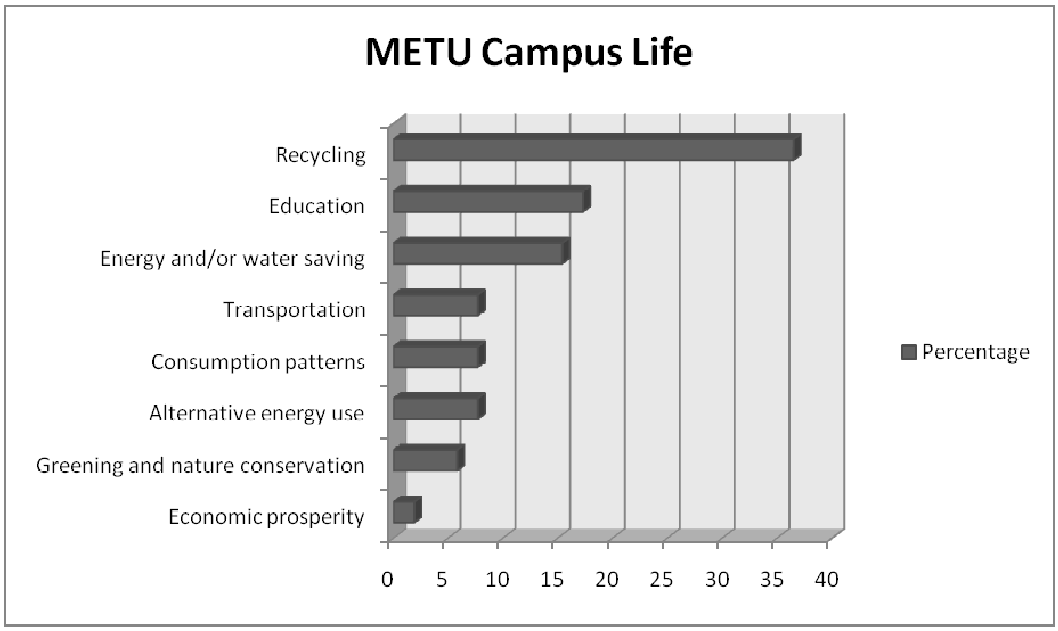

Figure 4.17 Faculty of Education Students' Suggestions for a Sustainable Campus Life

4.3.3 Faculty of Education Students' Attitudes towards Sustainable Development

The respondents who declared themselves as familiar with the terms of "sustainable development" or "sustainability" were also asked about their attitudes towards sustainability. As presented in Figure 4.18, majority of these students indicated favorable attitudes towards sustainability. More than half of these respondents (64.0%) reported that sustainability is "a good thing". Furthermore, one-fourth of these respondents (25.4%) identified themselves as "a passionate advocate" of sustainability. The rate of these respondents indicated a neutral statement of sustainability; "It is OK if others want to do it" was 7.3%. Additionally, a small percentage of students (2.8%) reported their non-commitment towards sustainability with an agreement to the statement of "I am not really bothered". The percentage of respondents who agreed with the

statement of "I think it is a waste of time and effort" was 0.4%, showing their negative attitudes towards sustainability.

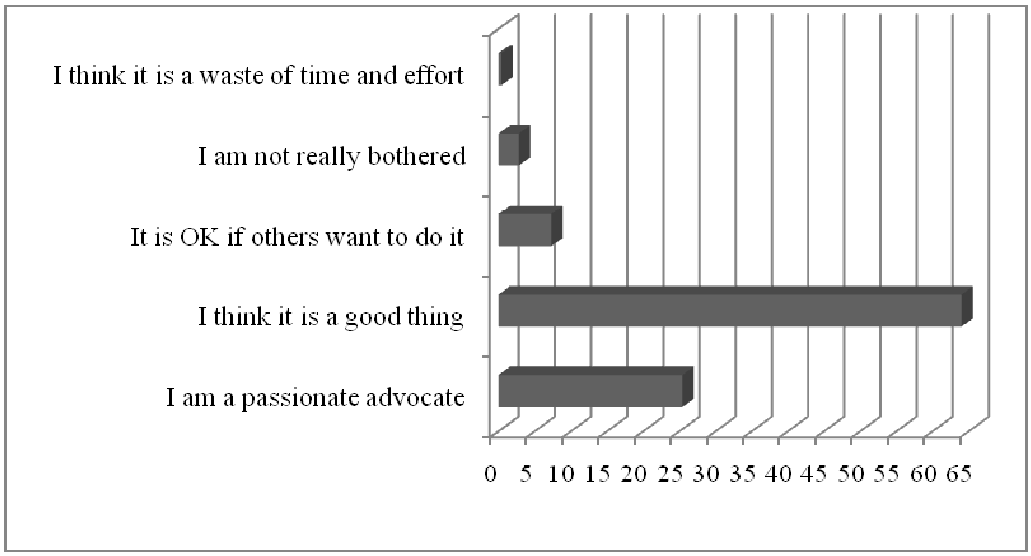

Figure 4.18 Faculty of Education Students' Attitudes towards Sustainable Development

In order to determine respondents' attitudes towards different aspects of sustainability, the percentages, means, and standard deviations of Faculty of Education students' responses were calculated through descriptive statistics. The mean score of 4.01 over 5 (S.D=0.47) on total subscale reflected respondents' favorable attitudes towards sustainability.

Regarding different aspects of sustainability, the mean score of 4.08 over 5 with a standard deviation of 0.49 showed that respondents developed feelings of concern on environmental deterioration and had favorable affects on environmental issues. Figure 4.19 presented the percentage of Faculty of Education students' responses to attitudinal items on environmental aspect of sustainable development. Most of the respondents agreed or strongly agreed with the statement dealing with the rights of plants and non-human animals (94.1%) as well as the statement related to changing our life styles in order to offset the danger of climate change (90.4%). Similarly, more than 80 percent of the

respondents agreed that we should avoid buying from a company which shows no concern for the environment (86.0%). The frequency analysis also reflected that most of the respondents were aware of the 'ecological crisis' that human beings face with (73.7%) and the fact that the natural resources are limited (65.5%).

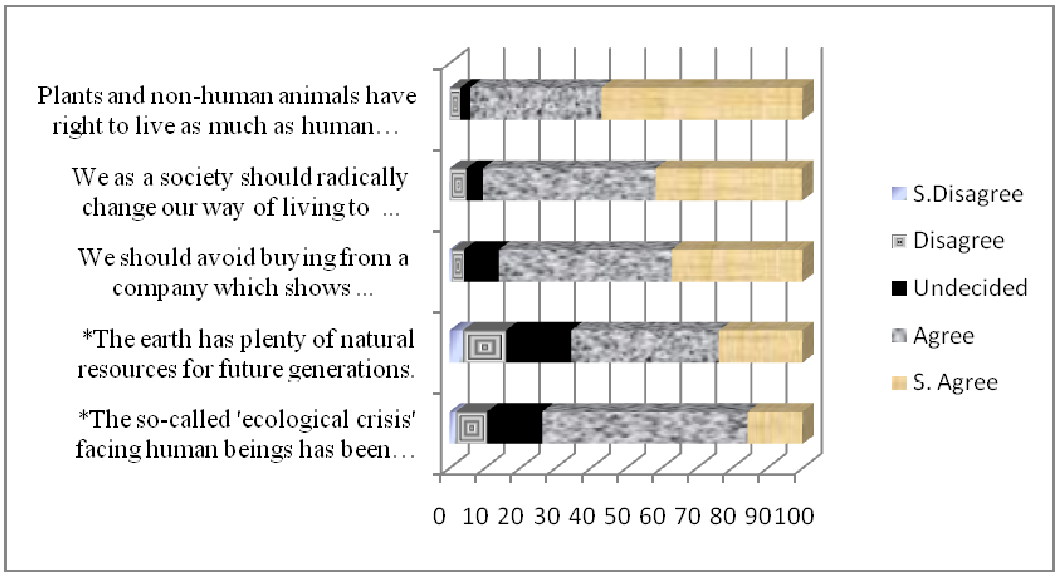

Figure 4.19 Faculty of Education Students' Attitudes towards Environmental Aspect

Looking at the economic aspect of sustainability, the mean score of 3.66 over 5 (S.D=0.47) reflected that these respondents could not develop strong feelings of concern toward economic aspect of sustainability issues and they were not ready to make some economic sacrifices for environmental protection. The percentage of Faculty of Education students' responses to attitudinal items on economic aspect of sustainable development was presented in Figure 4.20. The results showed that most of the respondents (79.6%) believed contribution of environmental protection to economic growth by creating jobs, and with a similar high percentage (77.3%) they agreed with the necessity to care about using home products. In addition, majority of the respondents (77.9%) opposed to the statement that Turkey should maintain high and stable levels of economic growth, even if it disregards environmental protection. However, relatively large

percentage of respondents (28.6%) was uncertain about using their own cars dependent on their economic opportunities although they agreed with making radical changes in order to offset the danger of climate change. The frequency analysis also showed that respondents who agreed that Turkey needs economic growth in order to protect the environment was 61.1%.

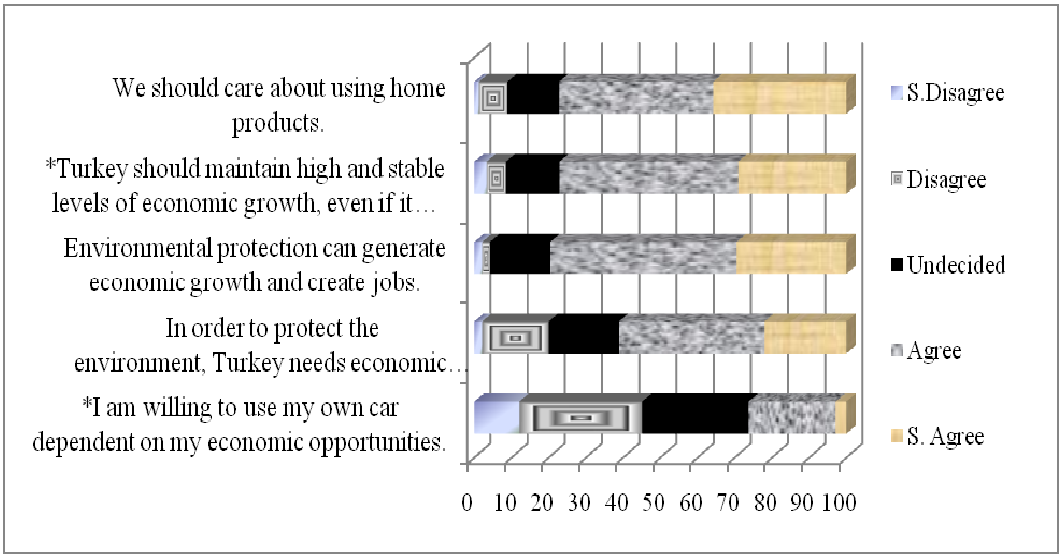

Figure 4.20 Faculty of Education Students' Attitudes towards Economic Aspect

Concerning the social aspect of sustainability, the mean score of 4.34 over 5 (S.D=0.54), which was relatively higher than that of environmental and economic aspect of sustainability indicated respondents' strong desires and affects towards sustainable social life styles. Figure 4.21 presented the percentage of Faculty of Education students' responses to attitudinal items on social aspect of sustainable development. More than 90 percent of respondents supported the idea that a city should ensure socially inclusive public transportation (96.6%). Similarly, majority of the respondents agreed with the statements that cultural diversity should be strongly supported (86.6%) and we should learn from cultures where people live harmoniously with nature (91.3%).

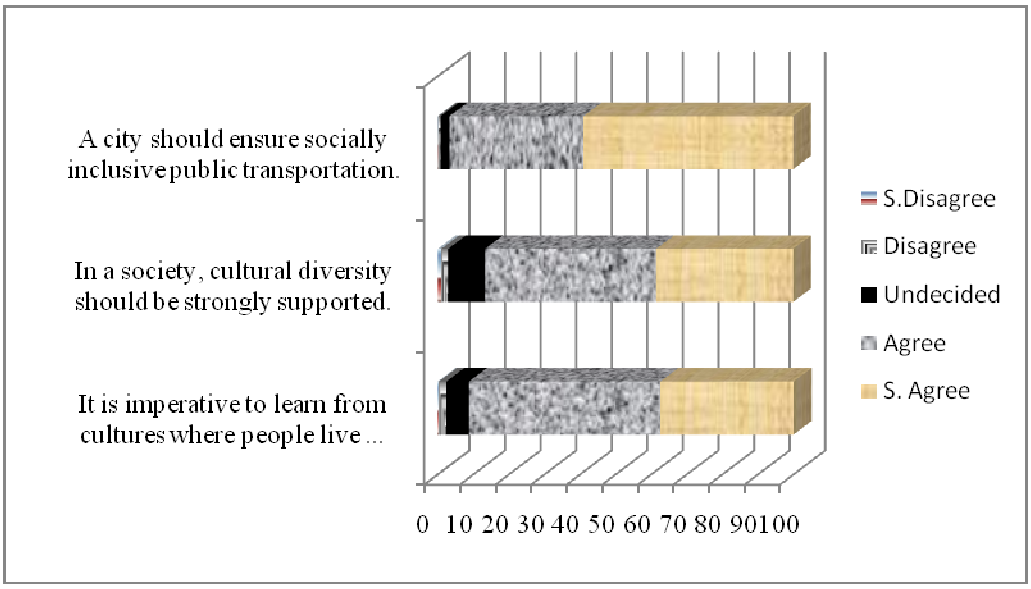

Figure 4.21 Faculty of Education Students' Attitudes towards Social Aspect

4.3.4 Faculty of Education Students' Environmental Values

In order to examine respondents' values toward the environment, the percentages, means, and standard deviations of Faculty of Education students' responses were calculated through descriptive statistics. The mean score of 4.01 over 5 with a standard deviation of 0.47 indicated that the respondents' developed favorable intrinsic values toward the nature and did not support the dominance of human beings on nature. The frequency analysis results on environmental values were presented in Figure 4.22. Large percentage of these respondents supported the view that humans are part of nature (88.7%). Similarly, majority of the respondents strongly agreed or agreed with the statement that humans have moral duties and obligations to other animal species (87.9%) or plants (81.7%). Furthermore, more than half of the respondents disagreed with the statement that humankind was created to rule over the nature (71.2%). On the other hand, respondents' opinions were divided when it came to their views on whether humans have the right to alter nature to satisfy wants and desires. One-fourth of these respondents (25.5%) were undecided about this statement, 25.6% of them declared that they agreed with this statement, while 48.9% of them reported that they disagreed with this statement.

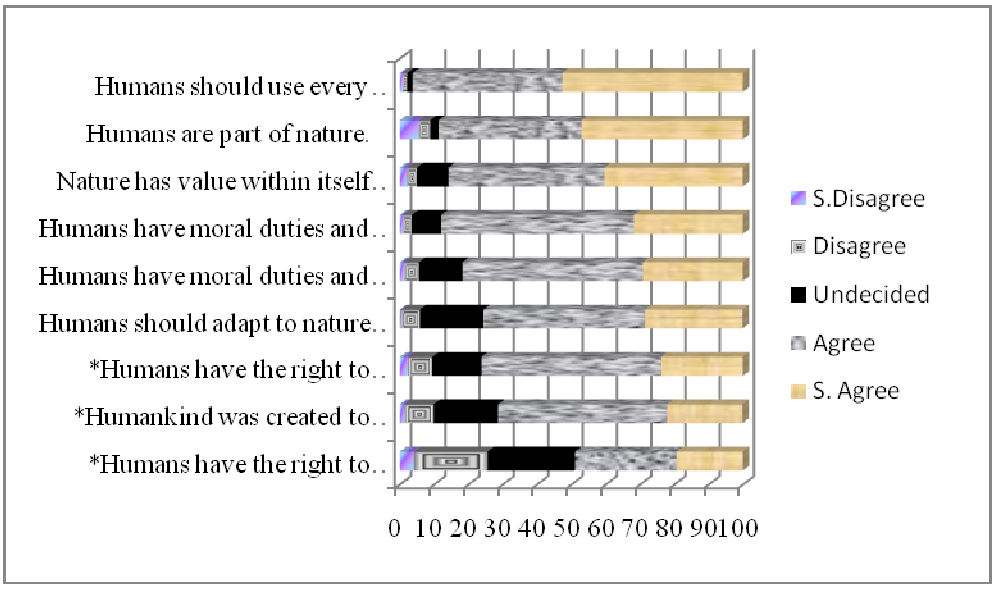

Figure 4.22 Faculty of Education Students' Responses to the Items on Environmental Values

4.3.5 Faculty of Education Students' Behaviors toward Sustainable Life Styles

In order to examine respondents' behaviors toward sustainable life styles, the percentages, means, and standard deviations of Faculty of Education students' responses were calculated through descriptive statistics. The mean score of 3.44 over 5 with a standard deviation of 0.53 showed that respondents were not taking all the necessary actions toward a more sustainable life. Figure 4.23 shows the percentage of participants' responses on items related to their behaviors toward sustainable life styles. The results of the frequency analysis reflected that all these actions were not taken with similar frequencies by the respondents. To be more specific, these students had more favorable behaviors to save energy and water, but they were not prepared to take political actions regarding environmental issues or to learn more about these issues. For instance, majority of these students' reported that they frequently or always made an effort to use less water when brushing their teeth and bathing (87.2%), while a small percentage of respondents (3.4%) declared that they frequently or always

attended a protest march or demonstration for environmental reasons. In addition, only 24.4% of the respondents reported that they frequently read publications that focus on environmental problems. The results also revealed that more than half of the respondents had changed their purchasing habits by choosing locally produced foods rather than imported products (57.4%).

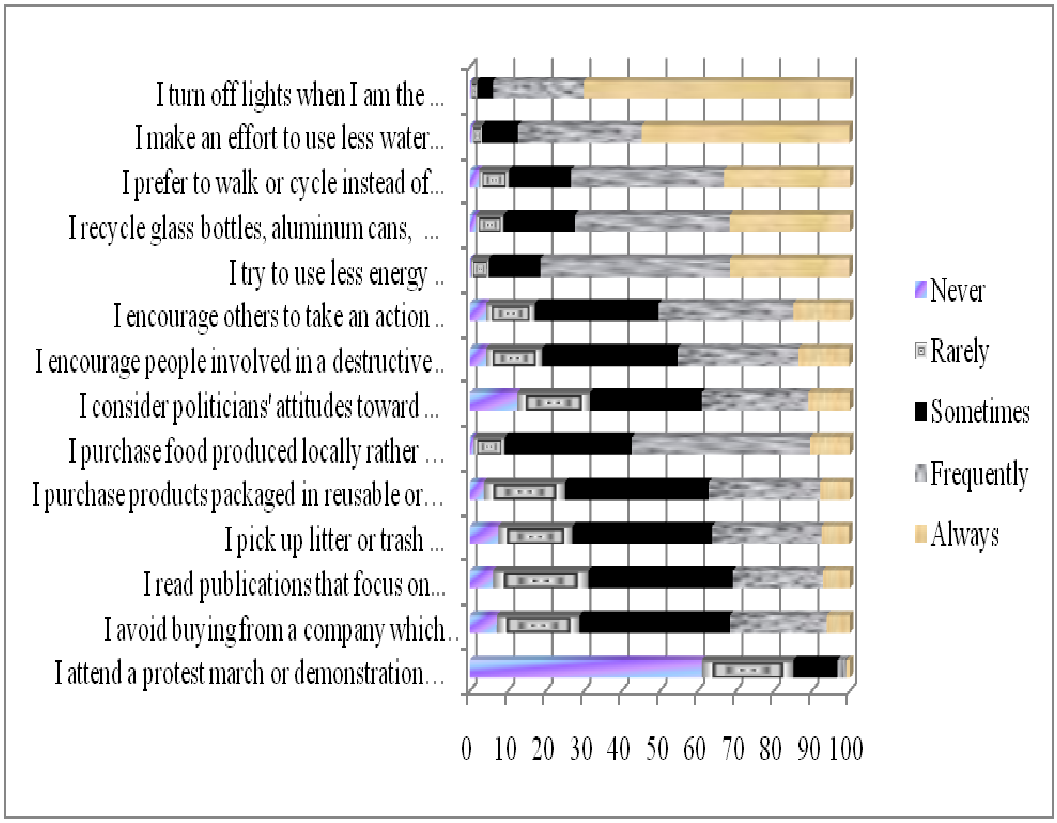

Figure 4.23 Faculty of Education Students' Behaviors toward Sustainable Life Styles

4.3.6 Faculty of Education Students' Views on the Future of Society

Faculty of Education students reflected their views on the future of society by selecting one of the scenarios modeled by Robertson (1983). Half of these respondents (51.8%) supported recent government policies about the environment, trade and social services together with a better educated youth in

order to attain a better future society. As presented in Table 4.13, one-fifth of the respondents (20.9%) had a pessimistic point of view for the future of society reporting their concern on ecological catastrophe and collapse of our social and economic systems. In addition, the same percentage of the respondents (20.1%) favored formation of local economies and ecological future to achieve a better future society. Relatively small percentage of the respondents (3.3%) advocated a strong authoritarian government to ensure a safe, healthy and sustainable society. On the other hand, the least selected scenario by the respondents (1.8%) was related to technological solutions for ecological problems and extreme poverty.

Table 4.13 Faculty of Education Students' Views on the Future of Society

Statements	Percentage (%)
Technological progress will overcome all ecological problems we face and eliminate extreme poverty.	1.8
We are headed straight for ecological catastrophe and in my lifetime I will see the consequent collapse of our social and economic systems.	20.9
The best way forward is the formation of local economies of exchange centered around the values of smallness, justice, eco-concern and living in voluntary simplicity.	20.1
Recent government policies about the environment, trade and social services combined with a better educated youth will ensure a safe, healthy, sustainable society living within ecological limits.	51.8
Only through strong authoritarian government will we be able to establish justice and equality which will ensure a safe, healthy, sustainable society living within ecological limits.	3.3
I do not have a personal view of the future of society.	2.1

4.3.7 Faculty of Education Students' Future Expectations for their Own Life

Figure 4.24 presented the importance of different statements for Faculty of Education students' happiness in the next ten years. The frequency analysis

results showed that having a job that makes a contribution to society was 'very important' for more than half of the respondents (56.0%). With a similar relatively large percentage, spending more time with family (45.7%) and spending more time in the natural environment (28.3%) was 'very important' for respondents' happiness in the next ten years. It also appeared that majority of these students did not declare that having a job that pays well and owning a car or a house were 'very important' for their personal happiness. In addition, working voluntarily for an environmental charity was not regarded as 'very important' or 'important' by the majority of the respondents for their personal happiness (57.1%).

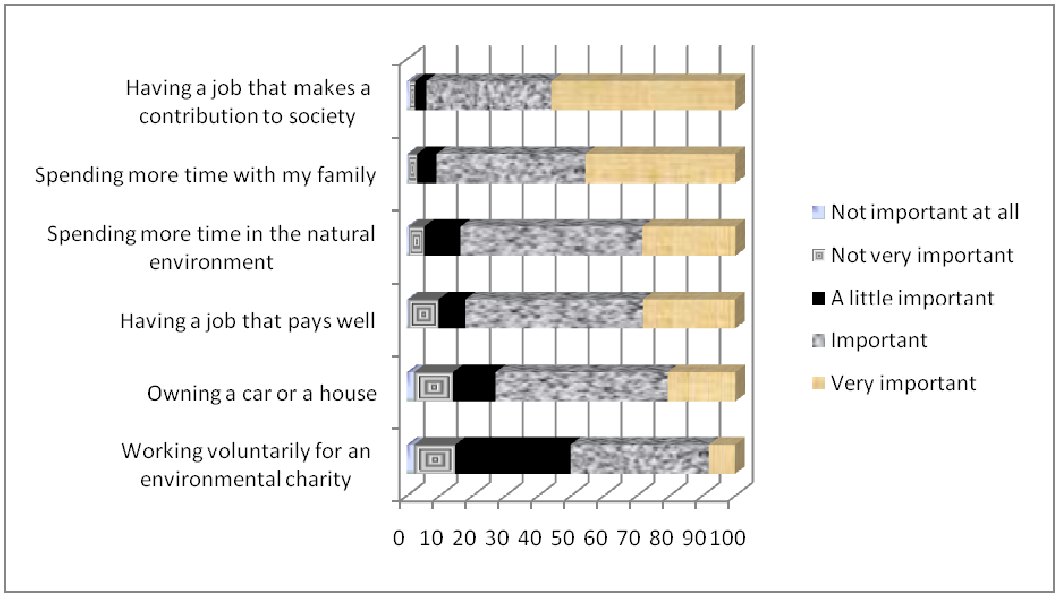

Figure 4.24 Faculty of Education Students' Future Expectations for their Own Life

4.3.8 Sustainability Goals of Society Proposed by Faculty of Education Students

The respondents were asked to rate the importance of statements related to possible sustainability goals of a society. The results showed that Faculty of Education students participated in the current study declared the importance of these sustainability goals for their own society (Figure 4.25). However, these

respondents believed that some of these goals held greater importance in development of the society. For instance, more emphasis on education (83.4%), attainment of health services for everyone (81.9%), struggling with terrorism (79.5%), struggling with poverty (71.9%) were regarded as 'very important' as a goal for their own society by large percentages of respondents. However, less than half of the respondents reported supplying the necessary opportunities for economic investments (41.9%) and respect for cultural diversity (48.1%) as 'very important' as a sustainability goal for their own society.

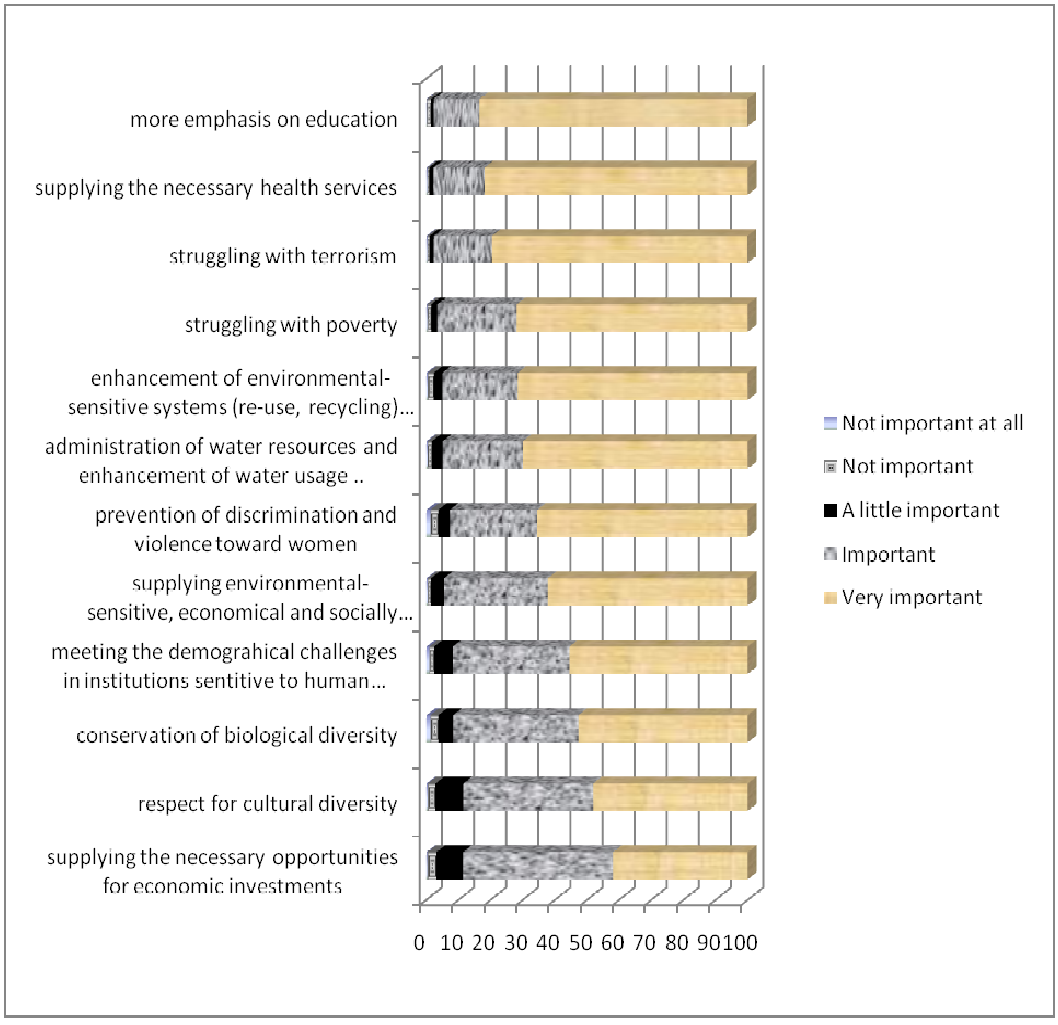

Figure 4.25 Percentage of Faculty of Education Students' Responses on Sustainability Goals of Society

4.3.9 Faculty of Education Students' Interest in Learning about Sustainability Issues

Faculty of Education students participated in the current study were asked to rate their own interest in learning about some issues related sustainability. The results (Figure 4.26) showed that more than half of the respondents were 'very interested' or 'interested' in learning more about these issues. However, these respondents showed higher willingness toward learning some of these issues. For example, relatively large percentages of respondents declared themselves as 'very interested' in learning about personal responsibilities (48.3%), strategies to reform health services (41.6%), conservation and management of water resources (40.1%). On the other hand, chemical wastes (14.8%), solid wastes and radioactive waste management (18.0%), sustainable settlement (19.0) and organic farming (21.1%) were among the issues that they were relatively less interested in.

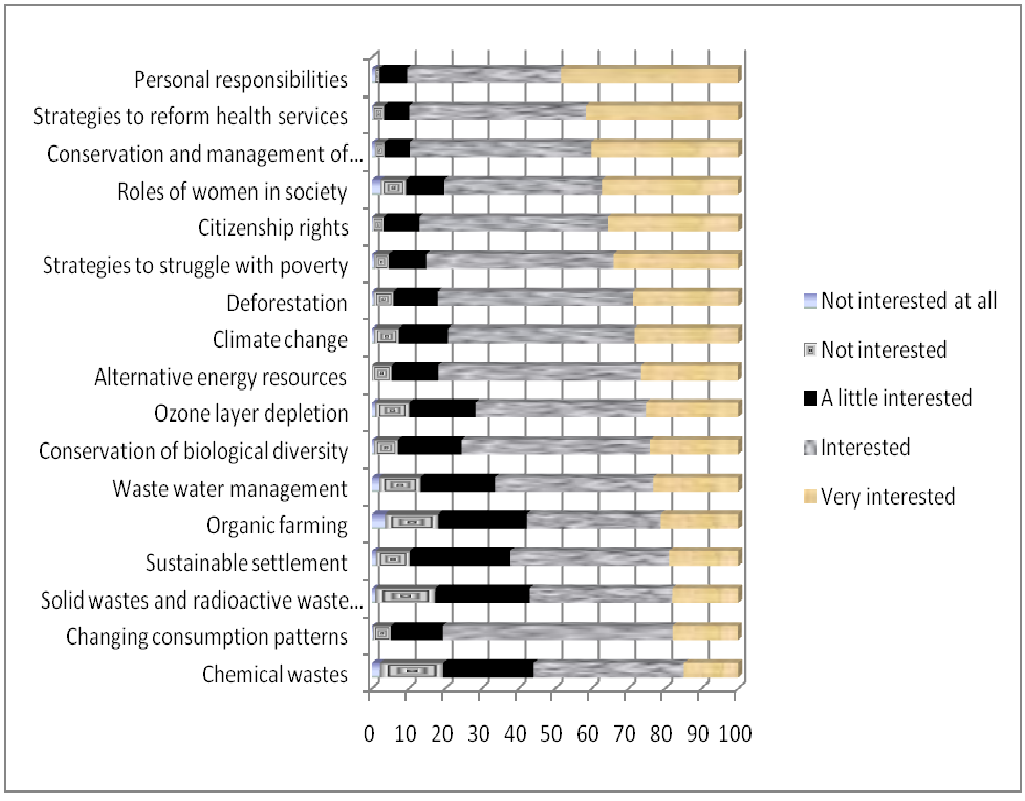

Figure 4.26 Faculty of Education Students' Interest in Learning about Sustainability Issues

4.4 Results Concerning Relationships among Variables of Faculty of Education Students' Sustainability Concern

In order to examine the relationships among variables of Faculty of Education students' sustainability concern, at the first stage factor analysis was conducted on the basis of related subscales (APPENDIX F). The observed variables representing the latent variables that would be included in the structural equation modeling were determined by using the same two criteria as it was in the modeling of METU students' sustainability concern. The minimum three observed variables were used and items with greater factor loadings were selected to generate each latent variable (Schumacher & Lomax, 1996). The first latent variable was related to respondents' behaviors toward sustainable life styles where *'I encourage others to take an action on behalf of the environment', 'I avoid buying from a company which shows disregard for the environment'*, and *'I purchase products packaged in reusable or recyclable containers'* were the items that constituted the latent variable. The second latent variable was respondents' environmental values, and the items generated this latent variable were *'Humans have the right to alter nature to satisfy wants and desires', 'Humans have the right to subdue and control nature'*, and *'Humankind was created to rule over nature'*. Another latent variable was related to respondents' attitudes toward different aspects of sustainable development which was constituted by the items of *'Plants and non-human animals have right to live as much as human beings do', 'Turkey should maintain high and stable levels of economic growth, even if it disregards the environment'*, and *'In a society, cultural diversity should be strongly supported'*. The fourth latent variable was respondents' tendency to read or watch media where *'newspaper', 'documentary'*, and *'news on TV'* were the items that generated the latent variable. The last latent variable was related to activities performed in nature and the items of *'camping', 'walking'*, and *'fishing'* constituted this latent variable.

The data file containing all the included observed variables was organized and imported into PRELIS 2.30 for Windows. After the data file was imported into PRELIS 2.30 for Windows and the necessary steps were acquired,

LISREL 8.30 for Windows with SIMPLIS command language was conducted for formulating and estimating the structural equation models of Faculty of Education students who participated in the current study. The structural equation modeling analysis was conducted by using the listwise deletion method in missing values analyses and the method Maximum Likelihood in modeling analysis. Moreover, in all the analyses, significance level of 0.05 is used.

Firstly, the theoretical model presented in Chapter 1 was tested with Faculty of Education students participated in the current study. Later, the following non-significant paths were deleted from the model.

When the Null Hypothesis, *'The path coefficient from sex to Faculty of Education students' attitudes toward different aspects of sustainable development is not significant'* was tested, it was observed that the calculated path coefficient of -0.01 was not significant with a t-value of -0.18. For this reason, this null hypothesis was failed to reject.

Testing the Null Hypothesis, '*The path coefficient from media to Faculty of Education students' activities performed in nature is not significant'* revealed that the path coefficient of 0.07 was not significant with a t-value of 1.08. As a result, this null hypothesis was failed to reject.

When the Null Hypothesis, '*The path coefficient from Faculty of Education students' activities performed in nature to behaviors toward sustainable life styles is not significant'* was tested, it was observed that the calculated path coefficient of -0.32 was not significant with a t-value of -0.69. For this reason, this null hypothesis was failed to reject.

Testing the Null Hypothesis, *'The path coefficient from Faculty of Education students' attitudes toward sustainable development to behaviors toward sustainable life styles is not significant'* revealed that the path coefficient of -0.12 was not significant with a t-value of -0.66. As a result, this null hypothesis was failed to reject.

Later on, thirteen covariance terms were added to the SIMPLIS syntax in order to improve the model considering the highest meaningful modification indices. The final SIMPLIS syntax for Faculty of Education students'

sustainability concerns can be found in the APPENDIX G. LISREL estimates of parameters in structural model of Faculty of Education students in which the coefficients were in standardized values was presented in Figure 4.27. Moreover, the Figure 4.28 displayed LISREL estimates of parameters in structural model of Faculty of Education students in which the coefficients were in t-values.

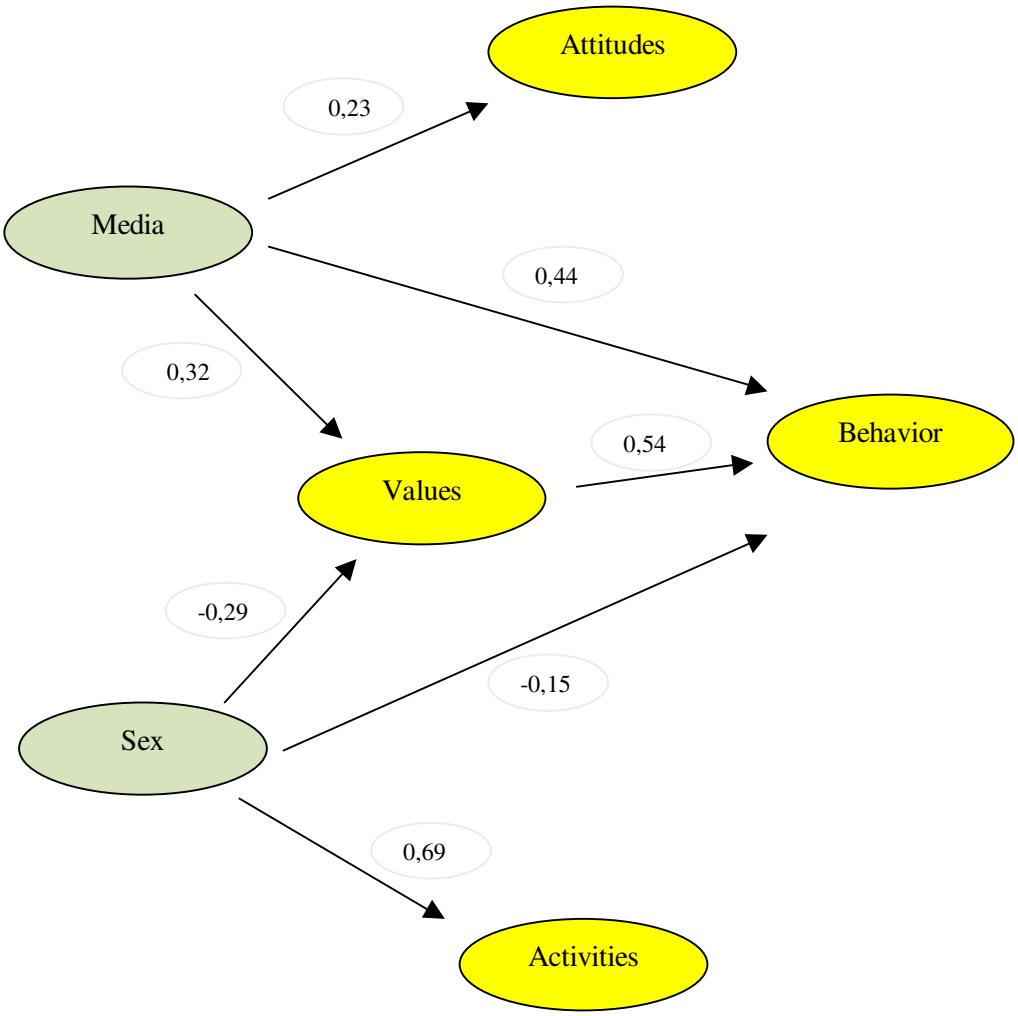

Figure 4.27 LISREL Estimates of Parameters in Structural Model of Faculty of Education Students (Coefficients of Standardized Value)

As it was shown in Figure 4.27 and Figure 4.28, the structural equation model of Faculty of Education students' sustainability concerns was consisted of two latent exogenous variables and four latent endogenous variables. The latent exogenous variables were 'Tendency to Read or Watch Media' (Media) and Sex (Sex), while the latent endogenous variables were 'Attitudes towards Different Aspects of Sustainable Development' (Attitudes), 'Values toward the Environment' (Values), 'Behaviors toward Sustainable Life Styles' (Behavior), and 'Activities Performed in Nature' (Activities).

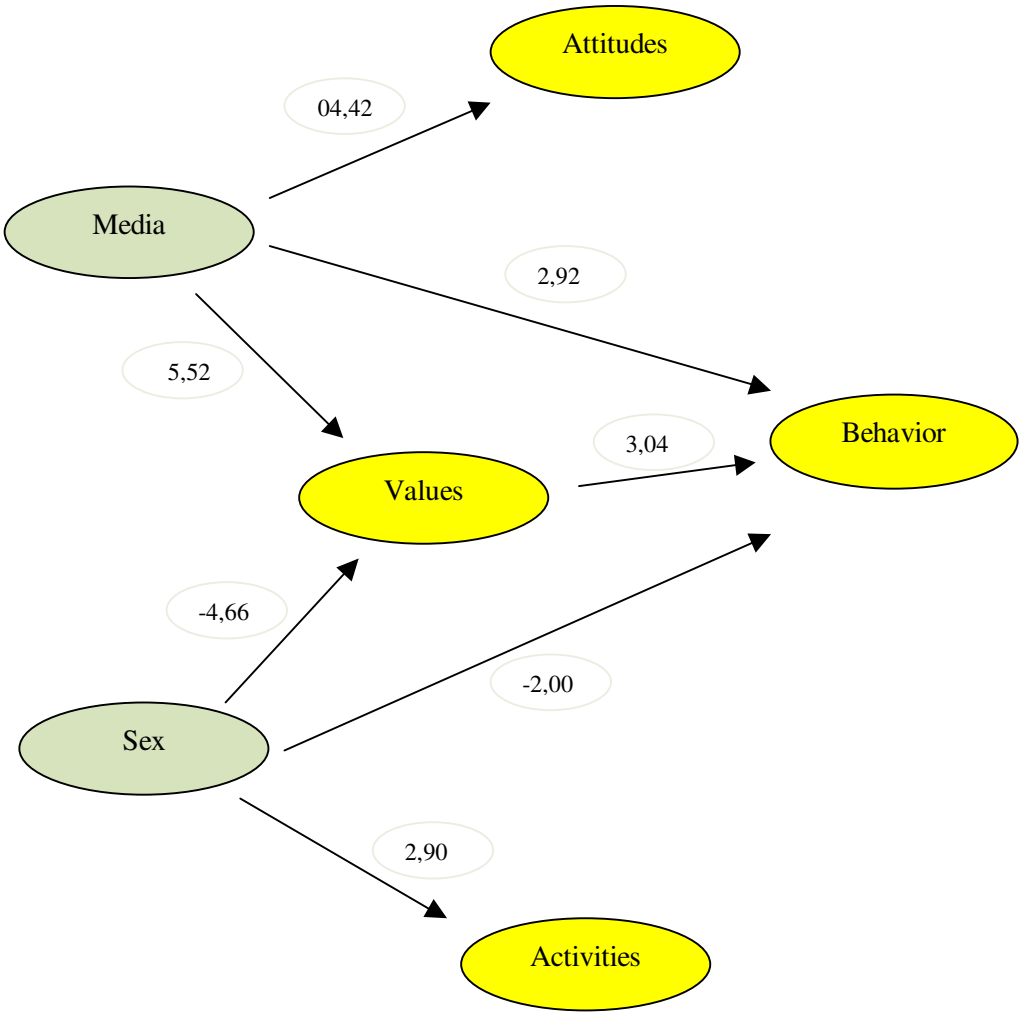

Figure 4.28 LISREL Estimates of Parameters in Structural Model of Faculty of Education Students (Coefficients in T-Values)

The relationships between the latent variables and the observed variables were indicated by the measurement coefficients of the λ_y (lowercase lambda sub y) and the λ_x (lowercase lambda sub x) values. Furthermore, the ε (lowercase epsilon) and δ (lowercase delta) are the measurement errors for the Ys and Xs, respectively. Table 4.14 presented these measurement coefficients in standardized values for Faculty of Education students' sustainability concerns.

Table 4.14 Measurement Coefficients of Faculty of Education Students' Sustainability Concerns

Observed Variables	λ	Latent Variables	Measurement Error
AttitudeD	0.33 (λ_y)		0.85 (ε)
AttitudeH	0.64 (λ_y)	Attitudes	0.59 (ε)
AttitudeK	0.69 (λ_y)		0.52 (ε)
ValueA	0.87 (λ_y)		0.25 (ε)
ValueC	0.81 (λ_y)	Values	0.33 (ε)
ValueD	0.76 (λ_y)		0.43 (ε)
BehD	0.72 (λ_y)		0.48 (ε)
BehE	0.20 (λ_y)	Behavior	0.96 (ε)
BehN	0.24 (λ_y)		0.94 (ε)
Camp	0.73 (λ_y)		0.45 (ε)
Walk	0.26 (λ_y)	Activities	0.95 (ε)
Fish	0.65 (λ_y)		0.57 (ε)
Gender	0.64 (λ_x)	Sex	0.59 (δ)
Documentary	0.46 (λ_x)		0.80 (δ)
News	0.78 (λ_x)	Media	0.39 (δ)
Newspaper	0.47 (λ_x)		0.78 (δ)

Regarding the strength and direction of the relationships, the structure coefficients of the γ (lowercase gamma) and the β (lowercase beta) were considered. The structure coefficients of γ and β for Faculty of Education students' sustainability concerns which were displayed in standardized values were presented in Table 4.15.

Table 4.15 The Structure Coefficients of γ and β for the Model

Latent variables		**β**	**γ**	***t***
Behavior &	Values	0.54	-	3.04
	Attitudes	-	0.23	4.42
Media &	Values	-	0.32	5.52
	Behavior	-	0.44	2.92
	Behavior	-	-0.15	2.00
Sex &	Activities	-	0.69	2.90
	Values	-	-0.29	4.66

The results presented in Figure 4.27 further displayed the direct effects of the latent exogenous variables on the latent endogenous variables. However, LISREL output of the structural model also provided the indirect effects and the total effects of latent exogenous variables on latent endogenous variables. The values of the indirect effects and total effects of latent exogenous variables on latent endogenous variables were presented in Table 4.16 and Table 4.17.

Table 4.16 Indirect Effects of Latent Exogenous Variables on Latent Endogenous Variables for Faculty of Education Students Structural Model

Endogenous Variables	Exogenous Variables	
	Media	Sex
Attitudes	-	-
Values	-	-
Activities	-	-
Behavior	0.17	-0.16

Table 4.17 Total Effects of Latent Exogenous Variables on Latent Endogenous Variables for Faculty of Education Students Structural Model

Endogenous Variables	Exogenous Variables	
	Media	Sex
Attitudes	0.23	-
Values	0.32	-0.29
Activities	-	0.69
Behavior	0.61	-0.31

The results presented in Figure 4.27 further showed that Media had a positive direct relationship with Attitudes ($\Gamma = 0.23$, $p < 0.05$). On the other hand, this latent exogenous variable did not have an indirect relationship with Attitudes. The latent exogenous variable of Sex was not reported to have a direct and indirect relationship with Attitudes.

The latent exogenous variables of Media and Sex had significant and positive effects on Values (Γ=0.32, $p < 0.05$; Γ=-0.29, $p < 0.05$, respectively). However, these latent exogenous variables did not have significant indirect effects on Values.

Since the latent exogenous variable Media did not have any direct relationship with Activities, the indirect effect of this variable on Activities was

investigated. Media did not have significant indirect relationship with Activities. The latent exogenous variable Sex had a significant and positive direct relationship with Activities (Γ=-0.69, $p < 0.05$), but Sex did not have a significant relationship with Activities.

The latent exogenous variables of Media and Sex had significant effects on Behavior (Γ=0.61, $p < 0.05$; Γ=-0.31, $p < 0.05$, respectively). These variables had also significant indirect effects on Behavior (Γ=0.17, $p < 0.05$; Γ= -0.16, $p < 0.05$, respectively).

The LISREL results presented in Figure 4.27 further displayed the direct effects between the latent endogenous variables. The latent endogenous variable of Values had a positive and significant direct effect of 0.54 ($p < 0.05$) on Behavior. The LISREL output, however, showed that the indirect effects between latent endogenous variables were not statistically significant.

The structural model of Faculty of Education students' sustainability concerns was evaluated with respect to the goodness-of-fit indices. The critical values of the goodness-of-fit statistics which were used in the present study were summarized in Table 4.10.

The Chi-Square, χ^2 = 210.81, was significant with degrees of freedom, df=69, and the significance level, p = 0.000. But, the χ^2 criterion was reported to have a tendency showing a significant probability level as the sample size increases, generally above 200 (Schumacker & Lomax, 1996). The sample size for Faculty of Education students was greater than this value; therefore, a significant test statistic was obtained with this large sample. Furthermore, the Normed Chi-Square (NC), which was calculated by χ^2 /df, of the model for Faculty of Education sample was 3.06 which was less than 5 indicating a good fit to the data (Kelloway, 1998).

The Goodness-of-Fit Index (GFI) and the Adjusted Goodness-of-Fit Index (AGFI) of the structural model for Faculty of Education students were 0.96 and 0.93, respectively. Since these values were approaching to unity, the model had a good fit to the data.

The Root-Mean-Square Residual (RMR) of the model was 0.048. The value of RMR showed a good fit to the data since the value was less than 0.05. Another criterion for goodness-of-fit, the Root-Mean-Squared Error of Approximation (RMSEA) of the model was 0.054. This value of RMSEA did not indicate a good fit to the data. However, RMSEA of the model was in the 90 percent confidence interval for RMSEA which was from 0.046 to 0.063.

The Comparative Fit Index (CFI) of the structural model for Faculty of Education students was 0.95. Since this value was approaching unity, it indicated a good fit of the model to the data.

Another criterion used to decide on the fitness of model to the data was Expected Cross Validation Index (ECVI). The value of ECVI for the structural model of Faculty of Education students was 0.45. The ECVI of the model was contained in the 90 percent confidence interval for ECVI which was from 0.39 to 0.52. The confidence interval for the estimate of ECVI was also reported by LISREL. Since the ECVI value of the model was between the values of the confidence interval, it could be declared that the model indicated a good fit to the data.

In conclusion, some goodness-of-fit indices of the structural model were examined through their criteria and it was found that the model for Faculty of Education students showed a good fit to the data. Thus, all the indicators except for RMSEA suggested an overall fit between the structural model and the observed data.

4.4.1 Effect Sizes for the Structural Model of Faculty of Education Students' Sustainability Concerns

In the current study, R^2 values (Table 4.18), as an indicator for effect sizes were calculated by LISREL for the structural model of Faculty of Education students' sustainability concerns.

Table 4.18 Effect Sizes of the Model for Faculty of Education Students' Sustainability Concerns

Latent Variables	Squared Multiple Correlations (R^2)
Attitudes	0.05
Values	0.21
Activities	0.48
Behavior	0.73

For Faculty of Education students, the attitudes towards different aspects of sustainable development had a squared multiple correlation value of 0.05 which could be regarded as small effect size. On the other hand, the values toward the environment had a R^2 value of 0.21 which could be reported as medium effect size. The activities performed in nature had a R^2 value of 0.48, and the behaviors toward sustainable life styles had a R^2 value of 0.73 which could be declared as large because these effect size measures were greater than the large index 0.25. In conclusion, the included predictor variables explained 5% of the variance of attitudes towards different aspects of sustainable development; and 21% of the variance of the values toward the environment; 48% of the variance of the activities performed in nature; and 73% of the variance of the behaviors toward sustainable life styles.

4.5 Summary of Results

The results of the present study could be summarized as below:

- Most of the students at METU declared their familiarity with the terms of 'sustainability' and 'sustainable development'. These students also viewed sustainable development as "*development which meets the needs of the present without comprising the ability of future generations to meet their own needs*".
- More than half of the students at METU believed that the campus life supported sustainable usage of natural resources.

- Majority of these students had favorable attitudes towards sustainable development. Furthermore, when the respondents' attitudes toward different aspects of sustainable development were considered, it was found that these students had developed feelings of concern on environmental deterioration and had strong desires towards sustainable social life styles. However, these respondents did not hold strong feelings of concern toward economic aspect of sustainability issues.
- The descriptive statistics results revealed that the respondents' developed favorable intrinsic values toward the nature and did not support the dominance of human beings on nature.
- The relatively low mean score indicated that respondents were not readily taking all the necessary actions toward a more sustainable life. However, their actions already taken toward a more sustainable living did not show the same pattern for different fields of environmental concerns.
- Most of the respondents did not have a pessimistic view on the future of the society. These students supported recent government policies about the environment, trade and social services together with a better educated youth in order to attain a better future society.
- Having a job that makes a contribution to society, spending more time with family and in the natural environment was among the factors that were reported to be 'very important' for the happiness of these respondents. On the other hand, working voluntarily for an environmental charity was not regarded as 'important' by the majority of the respondents for their personal happiness in the next ten years.
- The students at METU emphasized the need to attain the goals related to environmental, economic, and social aspects of sustainable development. But, the respondents declared that some of the issues such as more emphasis on education, attainment of health services for everyone, administration of water resources and enhancement of water usage efficiency, struggling with poverty were much more urgent when compared

with supplying the necessary opportunities for economic investments, conservation of biological diversity, and respect for cultural diversity.

- The METU students were highly interested in learning more about the sustainability issues.
- Media had a significant and positive relationship with METU students' behaviors toward sustainable life styles. That is, METU students which had a higher tendency to follow media by watching documentaries and news had also more favorable behaviors toward sustainable life styles.
- Attitudes had a significant and positive relationship with METU students' behaviors toward sustainable life styles. In other words, METU students with more favorable attitudes toward sustainability had more favorable behaviors toward sustainable life styles.
- Values was another variable that had a significant and positive relationship with METU students' behaviors toward sustainable life styles. In other words, METU students with higher intrinsic values toward the environment had more favorable behaviors toward sustainable life styles.
- Activities had a significant and positive relationship with METU students' behaviors toward sustainable life styles. In other words, METU students who spend more time in nature by performing some activities like walking, camping or fishing had more favorable behaviors toward sustainable life styles.
- Media had a significant and positive relationship with METU students' attitudes towards sustainable development. That is, METU students which had a higher tendency to follow media by watching documentaries and news had also developed more favorable attitudes towards sustainable development.
- Sex had a significant relationship with METU students' attitudes towards sustainable development. That is, female students at METU held more favorable attitudes towards sustainable development.
- Attitudes had a significant and positive relationship with METU students' activities in nature. This result reflected that METU students' with more

favorable attitudes towards sustainable development preferred to spend more time in nature by some activities like walking, camping or fishing.

- Sex had a significant relationship with METU students' activities in nature. This indicated that male students at METU preferred to spend more time in nature by some activities like walking, camping or fishing.
- Media had a significant and positive relationship with METU students' activities in nature. That is, METU students with a higher tendency to follow media by watching documentaries and news preferred to spend more time in nature by some activities like walking, camping or fishing.
- Activities had a significant and positive relationship with METU students' values toward the environment. In other words, METU students performing some activities in nature had higher intrinsic values toward the environment.
- Sex had a significant relationship with METU students' values toward the environment. That is, female students at METU had more favorable intrinsic values toward the environment than males.
- In general, descriptive statistics results for Faculty of Education students showed approximately close patterns as the results of METU students. However, structural equation models for the sustainability-related variables did not match when these two samples were considered.
- Media had a significant and positive relationship with Faculty of Education students' behaviors toward sustainable life styles. That is, these students which had a higher tendency to follow media by watching documentaries and news had also more favorable behaviors toward sustainable life styles.
- Values was another variable that had a significant and positive relationship with Faculty of Education students' behaviors toward sustainable life styles. In other words, the students with higher intrinsic values toward the environment had more favorable behaviors toward sustainable life styles.
- Sex had a significant relationship with Faculty of Education students' behaviors toward sustainable life styles. In other words, female students at Faculty of Education had more sustainable behaviors in their daily lives.

- Attitudes and Activities did not show a significant relationship with Faculty of Education students' behaviors toward sustainable life styles.
- Media had a significant and positive relationship with Faculty of Education students' attitudes towards sustainable development. That is, the students which had a higher tendency to follow media by watching documentaries and news had also developed more favorable attitudes towards sustainable development.
- Media had also a significant and positive relationship with Faculty of Education students' values toward the environment. This result indicated that the students which had a higher tendency to follow media by watching documentaries and news had a higher tendency to develop intrinsic values toward the environment.
- Sex had a significant relationship with Faculty of Education students' values toward the environment. That is, female students at Faculty of Education held higher intrinsic values toward the environment.
- Sex had also a significant relationship with Faculty of Education students' activities in nature. This indicated that male students at Faculty of Education preferred to spend more time in nature by some activities like walking, camping or fishing.

CHAPTER V

CONCLUSIONS, DISCUSSIONS AND IMPLICATIONS

This chapter presents the summary of the research study, conclusions and discussion of the results, and finally announces the implications of the study and recommendations for further studies.

5.1 Summary of the Research Study

For the specified purposes of this study, the responses of 958 students at Middle East Technical University who filled out the online web-based questionnaire in spring semester of 2007-2008 academic year were considered. Furthermore, in order to obtain a representative sample of the students from Faculty of Education at Middle East Technical University, the same questionnaire was administered to 688 students from this faculty by the researcher in classroom environment. By this way, it was ensured to examine the sustainability concerns of future implementers of ESD. To obtain the sample of the present study, the strategy of convenience sampling was used. Survey research was the methodology utilized during the course of the current study.

5.2 Conclusions and Discussion of the Results

University students' familiarity and current understandings of sustainable development; their attitudes, values and behaviors related to sustainable development; and their perceptions of their own and society's future have been the major concern of this discussion. Furthermore, significant predictors of university students' values toward the environment, and attitudes and behaviors toward sustainable life styles have been discussed accordingly in the following sections.

5.2.1 University Students' Familiarity and Current Understandings of Sustainable Development, and their Views on Sustainable Living at METU Campus

The current study showed that more than half of the respondents including two focus groups namely, METU students and students at Faculty of Education identified themselves as familiar with the terms of 'sustainable development' or 'sustainability'. Furthermore, these students declared 'sustainable development' as "*development which meets the needs of the present without comprising the ability of future generations to meet their own needs"* which has become a widely known definition after its report in Our Common Future (WCED, 1987). However, respondents' awareness for the standard definition of this term may not mean that these students have developed a sound understanding of contested and multi-faceted nature of sustainable development. In fact, the results revealed that the university students participated in the current study did not hold an adequate understanding of 'sustainable development'. Consistent with the other studies conducted in this field (e.g Alkis and Ozturk, 2007; Azapagic, Perdan, and Shallcross, 2005; Kagawa, 2007; Summers, Corney, and Childs, 2004), there exist some knowledge gaps in university students' perceptions toward different aspects of sustainable development. The respondents declared sustainable development as mostly related with environmental aspect of this term. Since, these students advocated sustainable development in the context of effective usage of natural resources. To be more specifically, 'environment' (5,6%) and 'environmental protection' (6,7%) were the keywords that appeared most frequently in the keywords section. It appeared that most of the university students participating in this study developed personal awareness and consciousness with regard to preservation of nature and environmental quality, but not with sustainable development as a holistic concept. Accordingly, it was found that social, political, cultural, and economic aspects of sustainable development were less emphasized among the keywords suggested by the respondents. For instance, none of the respondents mentioned some major issues associated with sustainable development such as cultural diversity, political will,

human rights, and democracy although these terms were suggested by some authors (e.g Sterling, 2004) in the field of education for sustainable development. In other words, social and economic aspects of sustainable development were often neglected by the respondents in the present study. Furthermore, these students seemed to be lack of an understanding that associates social development in particular with productive sectors, equity, wealth, equal opportunity and poverty. In fact, sustainable development is advocated to be a way to achieve for all humankind a rich quality of life by bridging developmental issues with environmental concerns (National Research Council, Policy Division, Board on Sustainable Development, 1999). Furthermore, in line with these international agreements, it is obvious that sustainability transition is not possible just with a social revolution or a technological miracle. But, sustainability transition depends on changing life styles, values, or economic systems and this should be supported by political will and governmental commitment. In this aspect, university students' conceptualizations of sustainable development which were lack of changing life styles, political initiations, and economic prosperity points out an urgent need to create sustainable development education programs.

Looking at respondents' views on sustainable living at METU campus, the results revealed that large percentage of respondents signaled sustainable living at the campus. However, the views of the respondents who declared themselves as 'very familiar' with the term of sustainable development leave some questions about the campus life in this context. Since, more than half of these respondents stated that there was much to do to create a sustainable METU campus and pointed out the necessary precautions in order to achieve this goal. At this point it should be noted that in line with their understanding of sustainable development, these respondents' suggestions also predominantly reflected environmental aspect of sustainable development. The students at METU campus associated sustainable living with regard to environmentally-oriented action plans such as environmentally sensitive transportation, enhancement of recycling project at METU campus, and water and/or energy saving. Although establishing resource conservation, recycling, and waste reduction at the universities have

been set as environmental responsibility (Creighton, 1998), this attempt is not sufficient for a shift towards more sustainable practices. Some indicators such as balance of economic and environmental considerations, promoting organic and fair-trade food consumption, and equal opportunities in community should be reflected in creating a sustainable life at university campus (Kohl, 2006). However, these indicators representing economic, social and political aspects of sustainable development were relatively less emphasized in METU students' expectations for a sustainable living at the campus. For example, respect for cultural diversity, human rights, and economic prosperity were not complemented with a sustainable campus life by these respondents. In this context, it appears that the authorities at Middle East Technical University should undertake the responsibility to provide future leaders an opportunity to live in a sustainable campus where they could develop their knowledge, skills, attitudes, and values to create a sustainable future. As supported by some authors (Turner, 1984; White, 2003), university students' surroundings of their own campus are thought to address sustainability concerns while developing these students' understanding of sustainable development.

5.2.2 University Students' Attitudes, Values, and Behaviors toward Sustainable Life Styles

This survey revealed that METU students participated in the current study had favorable attitudes toward sustainable development, advocating this process as a 'good thing' (58,4%) or identifying themselves as 'passionate advocators' of sustainability (34,5%). Furthermore, majority of the students at Faculty of Education as the future implementers of education for sustainable development had also positive attitudes towards sustainable development, declaring this process as 'good thing' (64,0%) or identifying themselves as 'passionate advocators' of sustainability (25,4%). Parallel with the research findings conducted by Kagawa (2007), the respondents who identified themselves as 'very familiar' with the term of 'sustainable development' had a higher tendency to be a 'passionate advocate' (57,6% of METU students who were very

familiar with this term; 57,1% of students at Faculty of Education who were very familiar with this term). However, those students who are familiar or not so familiar with this term believed that sustainable development is a 'good thing'. This result may reflect that familiarity with the term of 'sustainable development' could be referred as an indicator of favorable attitudes towards this process.

In addition to holistic evaluation of respondents' attitudes towards sustainable development, this survey also determined their attitudes with respect to environmental, economic, and social aspects of this process. The frequency analysis and mean score on environmental aspect of sustainable development indicated that two focus groups of the current study held favorable feelings of concern toward environmental deterioration. To be more specific, these respondents, as the citizens of a developing country, showed the general tendency that was reported in some worldwide surveys on environmental concern. Interestingly, respondents from developing countries had higher feelings of concern and attitudes toward the environment than from developed countries (Dunlap, Gallup and Gallup, 1993). In the present study, most of the respondents have believed that human beings are facing with ecological crisis so that we, as a society should radically change our life styles toward sustainability such as not buying from a company which shows no concern for the environment. Furthermore, consistent with the results reported by Kagawa (2007) it appears that respondents had strong desires for social justice by showing agreements for cultural diversity and living harmoniously with the nature. However, when it comes to respondents' concerns with respect to interaction of environmental and economic aspects of sustainable development, some contradictions appear in the responses of both METU students and the students at Faculty of Education. For instance, these two focus groups supported the strong need for collective and radical changes in order to offset the danger of climate change, but they were also willing to use their own cars dependent on their economic opportunities. One possible explanation for this finding might be that university students were not ready to make some individual sacrifices from their own comforts to protect the environment. Another possible explanation might be that the city and the campus

in which the respondents were living did not provide the necessary opportunities for public transportation. In fact, these students also strongly supported the idea that the city that they were living in should ensure socially inclusive public transportation. Furthermore, the respondents' views on METU campus life have reflected that public transportation within the campus needs to be renovated with respect to environmental and social concerns.

As well as the university students' attitudes towards sustainable development, their values toward the environment were examined in the current study. Consistent with the responses of Turkish sample participating in the 2000 World Values Survey (Inglehart et. al, 2002), both METU students and the future implementers of education for sustainable development pointed out that human beings should coexist with nature. Furthermore, similar to developed societies like Europeans, North Americans, and Japanese participating in national surveys (Inglehart et. al, 2002) the respondents of the present study rejected the idea that human beings have the right to master nature. The respondents' agreement to the statements like *"Nature has values within itself regardless of any value humans place on it"* and *"Humans should adapt to nature rather than modify it to suit them"* indicated the importance given to nature and rejection of domination over nature at least at an abstract level. However, respondents' opinions were divided when it came to their views on whether humans have the right to alter nature to satisfy their wants and desires. Regarding the continuum of human-nature relationship in which ecocentrism at the one end and anthropocentrism on the other, the results indicated that the university students were obviously not closer to anthropocentric end of the continuum. On the other hand, it is questionable whether the respondents were passionate advocators of ecocentrism.

Looking at the personal behavioral changes toward more sustainable life styles, their preferred individual ways of living were not necessarily coherent with their critical agreements and statements. The actions most frequently taken by the respondents were reported as saving energy, recycling aluminum cans, glass bottles and paper, and changing forms of transportation. These actions, reflecting their responsibilities as consumers, displayed their placement in 'light

green' end on a 'light to dark green' spectrum (Porritt and Winner, 1988; Selby, 2000a, b). 'Dark green' actions representing "*a radical, visionary and fundamentalist challenge to the prevailing economic and political world order*" (Parritt and Winner, 1988, p.11) were less likely taken by the university students. For instance, consistent with the research results by Inglehart (2000), attending a protest march or a demonstration for environmental reasons and examining politicians' attitudes toward resolution of environmental problems were addressed as 'never' or 'rarely' by most of the respondents. As supported by some researchers (e.g Leiserowitz, Kates and Parris, 2005), the light green actions such as material consumption was advocated as a vehicle for transformation of values and attitudes into environmentally sustainable behaviors. It is obvious that light green actions could make significant changes towards a more sustainable world (Kagawa, 2007). However, we should take some extra responsibilities in order to provide an opportunity for the future generations to meet their own needs.

5.2.3 University Students' Views on the Future of Society and Sustainability Goals, and Future Expectations for their Own Life

The present research study also focused on emotional impact of global issues on university students by examining their views on the future of society. The findings revealed that approximately half of the respondents believed recent government policies combined with a better educated youth in order to ensure a safe, healthy, sustainable society living within ecological limits. The literature (Hicks, 2002) pointed out that young people might have some feelings of sadness, anxiety, insecurity, fear, and disregarding in learning about the current state of the planet. Furthermore, it has been proposed that there is a big gap on the area of research regarding the emotional impact of global problems on the students and it is urgently needed to develop and implement appropriate pedagogies to enhance students' sense of hope, liberation, and empowerment (Hicks, 2002). Fortunately, relatively small percentage of respondents participating in this study expressed anxiety and pessimism by their agreement to the statement '*We are headed straight for ecological catastrophe and in my lifetime I will see the consequent*

collapse of our social and economic systems'. However, it is obvious that these students with a pessimistic perspective should not be neglected and it is crucially needed to change their opinions for the future of the society. Regarding the students at Faculty of Education, the present study shows that they have the necessary vision to educate citizens with a sense of hope about the future of planet.

The other aim of the present study was to explore what would make university students' happy in the next ten years. Consistent with findings of The Future Leaders Survey (Forum for the Future, 2006/2007), the respondents from two focus groups of the current study were much less interested in the prospective wealth than the expected rates. More than half of the respondents pointed out that having a job that makes a contribution to society would be very important for their personal happiness in the next ten years. On the other hand, a small percentage of respondents advocated the same about having a job that pays well and owning a house or a car. These findings indicated that earning large amounts of money with higher salaries was not a precedent factor for the university students' expectations. Furthermore, it was the non-material things that they expected to fulfill, such as spending more time with family and spending more time in the natural environment in the next years. Keeping in mind that increasing consumption of material goods is a significant factor for unsustainable applications and the so-called 'ecological crisis', it might be concluded that the respondents' future expectations for their own life cultivates the sense of hope for the future.

In addition to university students' expectations for their own life, the respondents' views on the importance of sustainability goals were investigated in the current study. The frequency analysis results reflected that the goals which were also cited in Millennium Development Goals (United Nations General Assembly, 2000) and Johannesburg Declaration (WSSD, 2002) were regarded as important for their own society by the university students. The issues which were presented as very important for the development of the society by most of the respondents were more emphasis on education, supplying the necessary health

services, management of water resources, and struggling with poverty. On the other hand, the issues of supplying the necessary opportunities for economic investments, biological diversity, and cultural diversity were not labeled as very important by large percentages of respondents. At this point it should be noted that the university students' responses might reflect the everyday realities and discussions of their own society. Some patterns connected to social, cultural and economical circumstances of the society could be seen in the university students' responses. To be more specifically, the poor citizens with low incomes or those who are deprived of health, education, safe drinking water and other aspects of human well-being are still the realty for Turkish society. Previous research studies (Rootzen, 2002; Schreiner and Sjoberg, 2005) have also indicated that social and environmental concerns, such as environmental risks or challenges facing a society are attached more importance if these concerns are linked to everyday life of the students than to challenges associated with more distant regions. This might be the reason why cultural and biological diversity were not declared as very important by the majority of the respondents. Looking at their willingness for economic aspect of sustainable development, the findings indicated respondents' desire to overcome poverty for their own society. In fact, the desire for economic development to struggle with starvation was proposed to be a universal view belonging to all cultural and national contexts (Leiserowitz, Kates and Parris, 2005). This assumption appears to be supported by the findings of the current study as well as the national surveys (Pew Research Center for the People and the Press, 2003). However, the results of the current study indicated that enhancement of opportunities for economic investments was not regarded as a solution to overcome poverty. This finding might be attributed to the fact that the citizens prefer to work for the public sector rather than making economic enterprises in Turkish culture. Thus, these individuals try to satisfy their wants and desires without taking any economic risks.

5.2.4 University Students' Interest in Learning about Sustainability Issues

The findings of the current study showed that students at METU and students from the Faculty of Education at the same university were readily motivated to learn about sustainability issues. But, these students had expressed higher willingness to learn some of these issues. Personal responsibilities, strategies to reform health services, conservation and management of water resources, alternative energy resources, citizenship rights, and strategies to struggle with poverty were among those issues where the respondents indicated their high interest in learning more about. On the other hand, some issues such as chemical wastes, organic farming, solid wastes and radioactive waste management did not attract their attention as much as the issues listed above. Interestingly, the frequency analysis results indicated a potential link between the goals identified as important for their own society and the issues that the respondents were interested in. For instance, supplying the necessary health services were declared as an important goal for their society and the respondents were willing to learn about strategies to reform health services. The same trend could be easily seen for the issues such as management of water resources and struggling with poverty. This finding might be attributed the fact that social and environmental concerns that a society come across with are attached more importance and interest when these concerns reflect everyday realities of individuals (Rootzen, 2002; Schreiner and Sjoberg, 2005). At this point it could be concluded that when the university students believe the importance of a goal for the development of their own society; this enforces or encourages them to learn more about the related issue.

5.2.5 Relationships among Variables of METU Students' Sustainability Concerns

The other focus of this study was to determine significant predictors of university students' behaviors toward sustainable life styles, and the relationships among these predictor variables. Consistent with the research studies (Barr, 2003;

Kaiser, Wölfing and Fuhrer, 1999; Oskamp, 1991) in the field of environmental psychology, attitudes towards sustainable development, which was also found to be a significant predictor of activities in nature, and values toward the environment were significantly and positively related to METU students' behaviors toward sustainable life styles. In other words, university students with more favorable attitudes towards sustainable development and more intrinsic values toward the environment readily take more sustainable actions. Some researchers (Thompson and Barton, 1994) have confirmed that individuals who believe the value of nature within itself and see human beings as a part of nature have also higher tendency to support sustainable development by taking the necessary actions. Furthermore, as it was also proposed by the literature review (Leiserowitz, Kates and Parris, 2005), the present study has shown that when people develop feelings of concern toward environmental deterioration and extreme poverty; and care for human development, they are more likely to engage actively with the social, environmental and economic aspects of sustainable development.

Concerning the relationships between attitudes and values as the significant predictors of behaviors, the results of the current study indicated that METU students' attitudes toward sustainable development showed not direct but indirect relationship with their values toward the environment. It could be concluded that METU students' values toward the environment can be predicted by their attitudes toward sustainable development not directly, but mediated by some other factors. The literature review (Murray and Murray, 2007) also leaves some questions about the relationships between these components. However, the inference which is clearly defined by the current study accompanied with the literature review (Murray and Murray, 2007) is that attitudes accompanied with values play a crucial role in shaping behaviors toward sustainable life styles.

Another set of variables, namely situational factors (Barr, 2003) that constituted from following media, sex, and activities in nature were examined in the current study with respect to their relationships with university students' behaviors toward sustainable life styles and the other significant predictors of this

variable. The results showed that following media had significant direct and indirect positive relationships with respondents' behaviors toward sustainable life styles and their activities in nature. Following media was also reported to have a significant and direct relationship with attitudes toward sustainable development; indirect relationship with values toward the environment. To be more specific, METU students who read newspaper, and watch news and documentaries on TV more frequently show higher tendency to take sustainable actions. At this point, it should be noted that mass media required to provide the basic information on sustainability literacy (Berberoglu and Tosunoglu, 1995; Palmer, 1993) enhances METU students' feelings of concern and care about sustainability issues, stimulates their values toward the nature, and finally result in behaviors toward more sustainable life styles. In recent years, the initiatives of Turkish mass media have grown up in order to stimulate public awareness toward sustainability issues. This finding shows that this emphasis of Turkish mass media has made a contribution in active engagement of METU students toward sustainable life styles.

Based on the findings of this survey, sex plays a significant role in the shape of the associated variables. The results showed that sex had a significant direct relationship with METU students' attitudes towards sustainable development, their values toward the environment, and activities in nature, whereas sex had a significant but indirect relationship with these students' behaviors toward sustainable life styles. As it was supported by literature review (Hines, Hungerford and Tomera, 1987), female students exhibit greater concern toward the risk-related sustainability issues with a more favorable support for the intrinsic value of nature than do male students. This finding might be attributed to the fact that the concern felt by females for nature is based on the conscious of taking care of health and personal well-being, since preservation of nature is a way of welfare and survival (Worsley and Skrzypiec, 1998; Tikka, Kuitunen and Tynys, 2000). Another possible explanation on different tendency of males and females regarding their attitudes and values was suggested by Tikka *et al.* (2000). These authors identified that females are more likely to master nature and derive

benefits from natural resources. However, females have a tendency to hold more emotional bonding toward the nature. Interestingly, male students at METU spend more time in nature by some activities like walking, camping or fishing, but female students seem to take more sustainable actions as a result of their favorable attitudes and values toward the environment.

Looking at the magnitudes of predictor variables, the squared multiple correlations calculated for the model of METU students' sustainability concerns indicated that these variables could explain endogenous variables with large proportions. For example, the linear combination of METU students' attitudes towards sustainable development, values toward the environment, activities in nature and following media were strong determinants of behaviors toward sustainable life styles. In addition, the other endogenous variables, namely attitudes towards sustainable development, values toward the environment, and activities in nature could be explained by the predictor variables with large proportions.

5.2.6 Relationships among Variables of Faculty of Education Students' Sustainability Concerns

The current study was conducted with a general view that Faculty of Education students at METU would have a precedent mission as the future implementers of ESD. Furthermore, these students are expected to pass their own actions toward sustainable life styles to their pupils at school. Thus, it was crucially needed to enhance active engagement of future implementers of ESD toward a more sustainable world. In this aspect, as a primitive stage to attain this goal, the present study also tried to determine significant predictors of Faculty of Education students' behaviors toward sustainable life styles, and the relationships among these predictor variables.

As it was suggested by some researchers in the field of environmental psychology (Barr, 2003; Kaiser, Wölfing and Fuhrer, 1999; Oskamp, 1991), Faculty of Education students' values toward the environment had a significant and positive relationship with their behaviors toward sustainable life styles. This

result indicated that Faculty of Education students who were not willing to touch upon the nature or control nature to satisfy wants and desires were more likely to engage in activities toward sustainable life styles. On the other hand, inconsistent with the models proposed by Barr (2003) and Oskamp (1991), Faculty of Education students' activities in nature and their attitudes towards sustainable development did not show a significant relationship with their behaviors toward sustainable life styles. This result reflects that there are some barriers which prevent translation of their positive attitudes into more sustainable life styles. For instance, as reported by some authors Scott and Willits (1994) there may be some contradictions or gaps between what people say and what they actually do. Alternatively, another barrier between attitudes and behaviors is related to people's capabilities (Leiserowitz, Kates and Parris, 2005). Faculty of Education students' external locus of control, literacy, knowledge, skills or perceived efficacy may hinder translation of attitudes into action. Finally, some structural concerns may act as a barrier in this process (Leiserowitz, Kates and Parris, 2005). To be more specific, infrastructures, availability of technological resources, social norms and expectations, and economic, social and political aspects (such as the prices of goods, special interest groups) should be considered as barriers which prevent translation of these students' attitudes into behaviors.

Among the situational factors (Barr, 2003), media and sex were the variables which showed significant relationships with Faculty of Educations students' behaviors towards sustainable life styles. It seems that when the future implementers of ESD read newspaper, and watch news and documentaries on TV, these actions encourage them to behave toward a more sustainable life. In addition, it was found that mass media was a significant contributor which plays crucial roles in shaping these respondents' attitudes towards sustainable development and values toward the nature. These findings reinforce the inference that mass media could be used as an effective subsidiary element in education for sustainable development (Schultz, 1994). Regarding the relationship between sex and the endogenous variables, the results indicated that female students from Faculty of Education had a higher tendency to have intrinsic values toward the

nature and take the necessary actions toward sustainable life styles than do male students. On the other hand, male students at Faculty of Education were more likely to take some activities in nature such as walking, camping, and fishing than female students.

Considering the effect sizes calculated for the model of Faculty of Education students, the present study indicated that the linear combination of values toward the environment, following media, and sex had a great contribution in shaping Faculty of Education students' behaviors toward sustainable life styles. However, the present study could not make powerful conclusions in explanation of these students' attitudes towards sustainable development and their values toward the environment. Furthermore, the investigation of potential barriers in translation of attitudes into sustainable behaviors could not be addressed in the present study.

5.3 Implications

The present study highlights some complexities which a public university in a developing country could face with at the primitive stage of reorientation toward a Copernicus Campus. In this aspect, the following suggestions could be offered for educators, curriculum developers, administrators, and the researchers who deal with the education for sustainable development in developing countries.

- In reorientation of formal curriculum to address sustainability, the reformists should work to embed needs of sustainable development by stating the interconnectedness of different aspects of this process more explicitly. At this point, environmental aspect of sustainable development should be linked with economic, social, cultural and political aspects of sustainable development in order to facilitate students' comprehension of multi-faceted nature of sustainable development.
- In both the process of creating curricula and their implementation, favorable attitudes of university students and their hope for the future of society should be regarded as an auxiliary agent. In general, learning has

been viewed as a cognitive process, but affective considerations should not be neglected in ESD. Appropriate pedagogies should be developed to help students transform their feelings into actions in order to create their own sustainable futures.

- The university students most frequently preferred to take some actions showing responsibility as consumers such as using less energy and water, recycling, and changing purchasing habits. In this aspect, the university campus should ensure the necessary infrastructures to facilitate these light green actions. At this point, it is worth taking into consideration these students' suggestions and expectations while creating a sustainable campus life. Although their active engagement with the light green actions plays significant roles toward a more sustainable world, more radical changes have been suggested to promote sustainable development. Rich learning opportunities to stimulate dark green actions should be discussed in reorientation of ESD curricula.
- In the process of creating curricula to address sustainability, the knowledge base, principles and guidelines are reformed through sustainability goals selected for the society. Goals proposed by the respondents of the current study will guide the reorientation of the formal curriculum.
- In creating an ESD curriculum, locally relevant issues that originates from the reality of the society constitutes the major content area, so these issues which the university students are also willing to learn about should be infused into the career programs related to sustainability.
- The media is responsible for collaboration with governments and educators in order to ensure and accelerate the shift from materialist to post-materialist values, from anthropocentric to ecocentric worldviews, and to ensure active engagement of citizens for a more sustainable world.
- The university campus should be well equipped with the necessary infrastructures that will satisfy the needs and encourage female students as well as male students to motivate them take some activities in nature.

- Values toward the environment were reported to have a crucial role for shaping behaviors toward more sustainable life styles. In this aspect, ecocentric worldviews about the environmental degradation and feelings of concern on human health and social well-being should be placed as strong motivators for actions in creating ESD curricula.

5.4 Recommendations for Further Studies

The present study has suggested a variety of useful topics for further studies. These suggestions could be summarized briefly as follows:

- Additional data collection strategy could be used in a further study to examine the generalisability of the online web-based questionnaire to METU population.
- A similar study should be conducted with a random sample from private universities to reach a generalization for Turkish population.
- A study should be conducted to identify sustainability concerns of university students attending different career-oriented degree programs.
- Further research is necessary to explore some strategies that enhance university students' behaviors toward sustainable life styles and associated variables.
- Similar studies should be conducted to investigate the holistic support of Turkish society for sustainable development.
- There is a strong need to examine the familiarity and understandings of academic staff on sustainable development and the potential barriers that handicap the effective exposition of an ESD curriculum.
- A future study should be conducted to propose a model for sustainability concerns of staff living in METU campus.
- To cross-examine the findings of the present study, some other indications (appropriate usage of recycle bins, total consumption of electricity and water in dormitories at METU campus, etc.) should be used in a further study.

- A further research study is crucially needed to determine the barriers which hinder translation of Faculty of Education students' attitudes into behaviors toward more sustainable life styles.
- Different personality characteristics such as skills, perceived efficacy or locus of control should be investigated as predictor variables of a model proposed by sustainability concerns of university students.
- University students' content knowledge on sustainability issues should be investigated in a further study to test their ability to take right decision for a more sustainable world.

REFERENCES

Algan, N. and Mengi, A. (2005) Turkey's Sustainable development policies in the EU Accession Process, *European Environmental Law Review,* 95-108.

Alkis, S. and Ozturk, M. (2007) Sustainable development in opinions of primary student teachers and pre-service teacher education in Turkey, *Paper presented at 2007 Symposium of the International Geographical Union - Commission on Geographical Education (IGU - CGE)*, Lucerne, Switzerland.

Azapagic, A., Perdan, S. and Shallcross D. (2005) How much do engineering students know about sustainable development? The findings of an international survey and possible implications for the engineering curriculum, *European Journal of Engineering Education, 30*(1), 1-19.

Baldassare M. and Katz C. (1992),The Personal Threat of Environmental Problems as Predictor of Environmental Practices, *Environment and Behavior, 24,* 602-616.

Ballantyne, R. and Packer, J. (2005) Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: what's the state of the game, *Environmental Education Research*, *11*(30), 21-35.

Barber, J. (2003) Production, consumption and the world summit on sustainable development, *Environment, Development and Sustainability, 5*(1), 63-93.

Barr, S. (2003) Strategies for sustainability: citizens and responsible environmental behavior, *Area, 35*(3), 227-240.

Bentler P. M. (1990) Comparative fit indexes in structural models, *Psychological Bulletin, 107*(2), 238–246.

Berberoglu, G. and Tosunoglu C. (1995) Exploratory and Confirmatory Factor Analyses of an Environmental Attitude Scale (EAS) for Turkish University Students, *Journal of Environmental Education, 26* (3), 40-44.

Björneloo, I. (2004) *From straight answers to complex questions: a study of premises for learning for sustainable development*, Göteborg: Göteborg University.

Board of Education [Talim ve Terbiye Kurulu Başkanlığı] (2004) *Talim Terbiye Kurulu program geliştirme çalışmaları* [Curriculum development studies of Board of Education]. Available at www.ttkb.meb.gov.tr (Accessed 15 June 2006).

Council for Environmental Education (1998) *Education for Sustainable Development in the Schools Sector: A Report from the Panel for Education for Sustainable Development,* Reading: Council for Environmental Education

Corraliza, J. A. and Berenguar, J. (2000) Environmental values, beliefs and actions: a situational approach, *Environment and Behavior, 32*, 832-848.

Coyle, K. (2005). Environmental literacy in America: What ten years of NEETF/Roper research and related studies say about environmental literacy in the U.S. *The National Environmental Education & Training Foundation.* Available at http://www.neetf.org/pubs/ELR2005.pdf (Accessed 25.6.2007).

Creighton, S. H. (1998) *Greening the Ivory Tower: Improving the environmental track record of universities, colleges and other institutions,* The MIT Press, Cambridge, MA.

Crocker, L. and Algina, J. (1986) *Introduction to Classical and Modern Test Theory,* Holt, Rinehart and Winston Inc.

Cross, R. (1998). Teachers' view about what to do about sustainable development, *Environmental Education Research, 4*(1), 41-53.

De Oliver, M. (1999) Attitudes and action: a case study of the manifest demographics of water conservation, *Environment and Behavior, 31*, 372-392.

De Young, R. and Kaplan, S. (1985-1986) Conservation behavior and the structure of satisfactions, *Journal of Environmental Systems, 15*, 233-242.

Department of the Environment [DoE] (1994) *Sustainable development: the UK strategy*, HMSO: London.

Department of Environment Food and Rural Affairs [DEFRA] (2002) *Achieving a better quality of life: review of progress towards sustainable development,* DEFRA: London.

Department of the Environment Transport and the Regions [DETR] (2002) *A better quality of life: a strategy for sustainable development for the UK,* The Strategy Office: London

Derksen, I. and Gartell, J. (1993) The social context of recycling, *American Sociological Review, 58*, 434-442.

Devall, B., and Sessions, G. (1985) *Deep ecology*, Salt Lake City, UT: Peregrine Smith Books.

Dogan, M. (1997) Ulusal çevre eylem planı: Eğitim ve katılım [National environmental action plan: Education and participation], Türkiye Çevre Vakfı, Ankara

Dresner, S. (2002) *The Principles of Sustainability*, Earthscan Publications Ltd, London.

Dubos, R. J. 1980. *The wooing of earth*, Scribner.

Dunlap, R. E., Gallup, G. H. and Gallup, A. M. (1993) Of global concern: Results of the Health of the Planet Survey, *Environment, 7*(15), 33-39.

Dunlap, R. E. and Van Liere, K. D. (1978) The 'New Environmental Paradigm', *Journal of Environmental Education, 9*, 10-19.

Dunlap, R. E., Van Liere, K. D., Mertig, A. G. and Jones, R. E. (2000) Measuring endorsement of the New Ecological Paradigm: a revised NEP scale, *Journal of Social Issues, 56*, 425-442.

Dyer, A. and Selby, D. (2004) *Centre for Excellence in Teaching and Learning: Education for Sustainable Development Stage Two*, University of Plymouth, Plymouth.

Egri, C., and Pinfield, L. (1996). Organizations and the biosphere: Ecologies and environments. In S. R. Clegg, C. Hardy,andW. R. Nord (Eds.), *Handbook of organization studies* (p. 459-483). London: Sage.

Elliot, J. (1998) Sustainable society and environmental education: future perspectives and demands for the educational system. *Paper presented at Oxford University Department of Educational Studies.*

Environics International (GlobeScan) 2002 *International Environmental Monitor*, Environics International: Toronto.

European Commission (2005) *Copernicus-Guidelines for Sustainable Development in the European Higher Education Area*, Copernicus-Campus. Available at http://www.unece.org/env/esd/information/COPERNICUS%20Guidelines.pdf (Accessed 23 March 2008)

Fien, J. (1993) *Education for the environment: critical curriculum theorising and environmental education,* Geelong, Deakin University Press

Forum for the Future (2002) *Learning for sustainable development: A curriculum toolkit*, Forum for the Future: London.

Forum for the Future (2006/2007) The Future Leaders Survey 2006/2007 Available at http://www.forumforthefuture.org/files/Futureleaders0607.pdf. (Accessed 21 July 2007)

Fraenkel, J. R. and Wallen, N. E. (1996) How to design and evaluate research in education, McGraw-Hill, Inc.

Gladwin, T., Kennelly, J., and Krause, T. (1995) Shifting paradigms for sustainable development: Implications for management theory and research, *Academy of Management Review, 20*(4), 874-907.

Gough, S. (2002) Increasing the value of the environment: a "real options" metaphor for learning, *Environmental Education Research*, 8, 61-72

Green S. B. and Salkind N. J. (2005) *Using SPSS for Windows and Macintosh: Analyzing and understanding data,* Upper Saddle River, NJ: Prentice Hall.

Gross, R. (2005) *Psychology: The Science of Mind and Behavior*, Hodder and Stoughton, London.

Haigh, M. (2005) Greening the university curriculum: appraising an international movement, *Journal of Geography in Higher Education, 29*(1), 31-48

Hicks, D. (2002) *Lessons for the future: The missing dimension in education*, RoutledgeFalmer, London.

Higher Education Funding Council for England (2005) Sustainable development in higher education: consultation on a support strategy and action plan, available at www.hefce.a.uk/pubs/hefce/2005/05_01/05_01.pdf (Accessed 11 May 2008)

Hines, J. M., Hungerford, H. R. and Tomera, A. N. (1987) Analysis and synthesis of research on responsible environmental behavior: a meta analysis, *Journal of Environmental Education, 18*, 1-8

Hopkins, C., Damlamian, J. and López Ospina, G. (1996) Evolving towards education for sustainable development: an international perspective, in: Summers, M., Corney, G. and Childs, A. (2005) Education for sustainable development in initial teacher training: issues for interdisciplinary collaboration, *Environmental Education Research, 11*(5), 623-647.

Hopper J.R. and Nielsen, J.M. (1991) Recycling as altruistic behavior: normative and behavioral strategies to expand participation in a community recycling program, *Environment and Behavior,* 23, 195–220.

Huckle, J. (1993) Environmental education and sustainability—a view from critical theory, in: J. Fien (Ed.) *Environmental education: a pathway to sustainability,* Geelong, Deakin University Press

Inglehart, R., Basanez, M., Diez-Medrano, J., Halman, L., Luijkx, R. (2002) *World values surveys and European values surveys, 1981-1984, 1990-1993, and 1995-1997*, Inter-university Consortium for Political and Social Research, Ann Arbor, MI: Institute for Social Research.

International Union for the Conservation of Nature and Natural Resources (1980) *World Conservation Strategy*. Gland, Switzerland, International Union for the Conservation of Nature and Natural Resources.

Kagawa, F. (2007) Dissonance in students' perceptions of sustainable development and sustainability: Implications for curriculum change. *International Journal of Sustainability in Higher Education, 8*(3), 317-338.

Kaiser, F. G., Wölfing, S., and Fuhrer, U. (1999) Environmental attitude and ecological behaviour, *Journal of Environmental Psychology, 19*, 1-19

Kates, R. W., Parris, T. M. and Leiserowitz, A. A. (2005) What is sustainable development? Goals, indicators, values, and practice, *Environment, 47*(3), 9-21.

Keating, M. (1993) Agenda for Change: A plain language version of Agenda 21 and other Rio Agreements, available at http://www.iisd.org/rio+5/agenda/declaration.htm (Accessed 30.10.2007)

Kelloway, E. K. (1998) *Using LISREL for Structural Equation Modeling*, London, New Delhi: Sage Publications.

Kohl, L. (2006) 12 Steps to a Sustainable Campus, School or Community, *Paper presented at North American Association of Environmental Education Annual Meeting*.

Kysilka, M. (1998) Understanding integrated curriculum, *The Curriculum Journal*, 9, 197–209.

Leiserowitz, A. A., Kates R. W., and Parris T. M. (2005) Do global attitudes and behaviors support sustainable development? *Environment, 47*(9), 22-38.

Leiserowitz, A., Kates, R., and Parris, T. (2006) Sustainability values, attitudes and behaviors: A review of multi-national and global trends, *Annual Review of Environment and Resources,* 413-444.

Lewis, C. S. (1953) *The abolition of man*, New York: Macmillan.

Luke, T. (2001) Education, environment and sustainability: what are the issues, where to intervene, what must be done?, *Educational Philosophy and Theory*, 33, 187-202

Marshall, M. G. and Gurr, T. R. (2003) *Peace and Conflict 2003*, Center for International Development and Conflict Management, University of Maryland, available at http://www.cidcm.umd.edu/paper.asp?id=2 (Accessed 12.08.2008)

McKeown, R. (2002) *Education for Sustainable Development Toolkit*, Center for Geography and Environmental Education, Knoxville.

Merchant, C. (1980) *The death of nature: Women, ecology and the scientific revolution*, San Francisco: Harper and Row.

Mertig, A. G. (2005) Michigan State University Environmental Survey of Freshman - Fall 2000 and Spring 2003, Available at http://www.ecofoot.msu.edu/documents/frosh.environmental.survey.pdf (Accessed 24.10.2007)

Moore, J. (2005) Barriers and pathways to creating sustainability education programs: policy, rhetoric and reality, *Environmental Education Research, 11*(5), 537-555.

Murray, P. E. and Murray S. A. (2007) Promoting sustainability values within career-oriented degree programmes: A case study analysis, *International Journal of Sustainability in Higher Education, 8*(3), 285-300.

National Research Council, Policy Division, Board on Sustainable Development (1999) *Our common journey: A transition toward sustainability,* National Academy Press, Washington, DC.

O'Riordan, T. (1993). The Politics of Sustainability, in Turner R.K. (Ed.), Sustainable Environmental Management: Principles and Practice, London: Belhaven Press. Available at http://v5o5jotqkgfu3btr91t7w5fhzedjaoaz8igl.unbf.ca/~yuri/ECON6805/SD1.pdf (Accessed 29.08.2008)

Orr, D. W. 1992, *Ecological literacy: Education and the transition to a postmodern world*, State University of New York Press, Albany.

Oskamp, S. (1991) *Attitudes and options*, Prentice Hall, Englewood Cliffs: NJ.

Ozdemir, I. (2003) The development of environmental consciousness in modern Turkey, In R. Foltz (ed.), *Environmentalism in the Muslim World*, Boston: MIT Press.

Palmer, J. (1998) *Environmental Education for the 21st Century,* London, Routledge.

Pauly, D., Christensen, V., Guénette, S., Pitcher, T. J., Sumaila, U. R., Walters, C. J., Watson, R. and Zeller, D. (2002) Towards sustainability in world fisheries, *Nature, 418*, 689-695

Pedhazur, E. J. (1982) *Multiple regression in behavioral research: Explanation and prediction*, Holt, Rinehart, Winston: New York.

Pew Research Center for the People and the Press (2003) *Views of a Changing World*. Washington, DC.: Pew Research Center for the People and the Press.

Pew Research Center for the People and the Press (2004) *The Pew Global Attitudes Project Dataset*. Washington, DC.: Pew Research Center for the People and the Press.

Porritt, J. and Winner, D. (1988), *The coming of the greens*, Fontana, London.

Raskin, P. (2002) *Great transition: The promise and lure of the times ahead.* Boston: Stockholm Environment Institute.

Reich, B., Alcock, C. (1976), *Values, Attitudes and Behaviour Change*, Methuan, London.

Robertson, J. (1983) *The Sane Alternative*, Spring Cottage, Ironbridge.

Rogerson, C. M. (2001) The waste sector and informal entrepreneurship in developing world cities, *Urban Forum, 12*(2), 247-259.

Rokeach, D. (1976) *Beliefs, attitudes and values: A Theory of organization and change*, Jossey-Bass, San Francisco,CA.

Rootzén, M. (2006) Perceptions of the concept of sustainable development among Russian and Swedish students, *Unpublished Ms Thesis,* Umea Universitet, Umea.

Qualifications and Curriculum Authority (2003) *What are the key elements and characteristics of ESD?*. London: QCA.

Sauvé, L. (1996) Environmental education and sustainable development: a further appraisal, *Canadian Journal of Environmental Education*, 1, 7-35

Sauvé, L. (2002) Environmental education: possibilities and constraints, *Connect: UNESCO International Science, Technology, and Environmental Education Newsletter*, 27, 1-4

Schreiner, C. and Sjoberg, S. (2005) A meaningful school science for today's youth?. *Nordic Studies in Science Education,* 2, 1-13.

Schultz, C. J. (1994) The role of the mass media in extension and interpretation, *International Journal of Environmental Education and Information, 13*(4), 371-84

Schumacker, R. E., and Lomax, R. G. (1996). *A beginner's guide to structural equation modeling*. Mahwah, New Jersey: Erlbaum.

Schwartz, S. H. (1992) Universals in the content and structure of values: theoretical advances and empirical test in 20 countries, *Advances in Experimental Social Psychology, 14*, 149-157.

Scott, W. and Gough, S. (2003) *Oral evidence to the House of Commons Environmental Audit Committee's enquiry into sustainable development,* University of Bath.

Scott, W. and Oulton, C. (1999) Environmental education: arguing the case for multiple approaches, *Educational Studies*, 25, 89-97.

Scott, D. and Willits F. (1994) Environmental attitude and behavior: A Pennsylvania survey, *Environment and Behavior, 26*, 239–260

Selby, D. (2000a) A darker shade of green: the importance of ecological thinking in global education and school reform, *Theory into Practice, 39*(2), 88-96.

Selby, D. (2000b) Global education as transformative education, *Journal for International Educational Research and Development Education, 23*(3), 2-10.

Stapp, W.B., Polunin, N. (1991) Global environmental education: towards a way of thinking and acting, *Environmental Conservation, 18*(1), 13-8.

State Statistics Institute (2004) Çevresel konulara ve sektörlere göre yatırım harcamaları, 1997-1999 [Cost of investments with respect to environmental issues and sectors] Available at http://www.die.gov.tr/TURKISH/SONIST/CEVRE/14042003t4.jpg (Accessed 20.11.2007)

Steel, B. (1996) Thinking globally acting locally? Environmental attiudes, behavior and activism, *Journal of Environmental Management, 47*, 27-36.

Steiger, J. H. (1990) Structural Model Evaluation and Modification: An Interval Estimation Approach, *Multivariate Behavioral Research, 25*(2), 173-180.

Sterling, S. (2001) *Sustainable education: revisioning learning and change,* Totnes, Greenbooks.

Stern, P. C., Dietz, T. and Guagnano, G. A. (1995) The new ecological paradigm in social-ecological context, *Environment and Behavior, 27*, 723-743.

Summers, M., Corney, G. and Childs, A. (2003) Teaching sustainable development in primary schools: an empirical study of issues for teachers, *Environmental Education Research*, *9*, 327-346.

Summers, M., Corney, G. and Childs, A. (2004) Student teachers' conceptions of sustainable development: the starting-points of geographers and scientists, *Educational Research, 46*(2), 163-182

Summers, M., Corney, G. and Childs, A. (2005) Education for sustainable development in initial teacher training: issues for interdisciplinary collaboration, *Environmental Education Research, 11*(5), 623-647.

Summers, M. and Kruger, C. (2003) Teaching sustainable development in primary schools: theory into practice, *The Curriculum Journal, 14*(2), 157-180

Sustainable Development Education Panel (2003) *Learning to last*.

Sutton, P. (2004) *A Perspective on environmental sustainability? A paper for the Victorian Commissioner for Environmental Sustainability*. Available at http://www.ces.vic.gov.au/CA256F310024B628/0/FE9C3A0DE353A819CA2571E6001BFA30/$File/A+Perspective+on+Environmental+Sustainability.pdf (Accessed 12 April 2007)

Taylor, N., Nathan, S. and Coll, R. K. (2003) Education for sustainability in Regional New South Wales, Australia: An exploratory study of some teachers' perceptions, *International Research in Geographical and environmental Education, 12*(4), 291-311.

Tikka, P. M., Kuitunen, M. T. & Tynys, S. M (2000) Effects of educational background on students' activity levels, and knowledge concerning the environment, *The Journal of Environmental Education*, 31, 12-20.

Thomas, I. and Nikita, J. (2002) Sustainability education and Australian universities, *Environmental Education Research, 8*(4), 475-492.

Thompson S.C. and Barton, M. (1994) Ecocentric and anthropocentric attitudes toward the environment, *Journal of Environmental Psychology,* 14**,** 149–157.

Tosunoglu, C. (1993) A study on the dimensions and determinants of environmental attitudes, *Unpublished PhD Dissertation,* Middle East Technical University, Turkey.

Tuncer, G., Sungur, S., Tekkaya, C., and Ertepinar, H. (2005) Young attitude on sustainable development: A case study, *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi [Hacettepe University Journal of Education], 29,* 187-193

Tuncer, G., Tekkaya, C., and Sungur, S. (2006) Pre-service teachers' beliefs about sustainable development: The effect of gender and enrollment to an environmental course, *Hacettepe Üniversitesi Eğitim Fakültesi Dergisi [Hacettepe University Journal of Education], 27*, 179-187.

Turner, P. V. (1984) *Campus: An American planning tradition*, The MIT Press, Cambridge, MA.

ULSF. University Leaders for a Sustainable Future. Available at www.ULSF.org (Accessed 15.05.2006)

UNESCO (1990). The Talloires Declaration.

UNESCO (2004). *United Nations Decade of Education for Sustainable Development: draft international implementation scheme*, Paris: UNESCO.

United Nations Conference on Environment and Development (UNCED) (1992) *Agenda 21: Action plan for the next century*, Rio de Janerio.

United Nations Development Program (UNDP) (2004) Turkey 2004 Human Development Report, *Information and Communication Technologies*, 9-11

United Nations General Assembly (2000) *United Nations Millennium Declaration*, Resolution 55/2.

Webster, K. (2004). *Rethink, Refuse, Reduce... Education for sustainability in a changing world,* Field Studies Publications.

White, S. S. (2003) Sustainable campuses and campus planning: Experiences from a classroom case study at the university of Kansas, *International Journal of Sustainability in Higher Education, 4*(4), 344-356.

World Commission on Environment and Development (1987). *Our common future,* Oxford, Oxford University Press

World Council of Churches (1974). *Report of Ecumenical Study Conference on Science and Technology for Human Development*, Geneva: World Council of Churches.

Worsley, A. & Skrzypiec, G. (1998) Environmental attitudes of senior secondary school students in South Australia, *Global Environmental Change*, 8, 209-255.

WSSD, Key outcomes of the summit (2002). World Summit on Sustainable Development. Available at http://www.johannesburgsummit.org/html/documents/summit-docs/2009-keyoutcomes-commitments.doc (Accessed 19.12.2006)

APPENDIX A

ÜNİVERSİTE ÖĞRENCİLERİNİN SÜRDÜRÜLEBİLİR KALKINMA İLE İLGİLİ GÖRÜŞLERİ ÜZERİNE BİR ÖLÇEK

A. Kişisel Bilgiler

1. Cinsiyetiniz nedir?

---- Kadın

---- Erkek

2. Şu anda kaçıncı sınıftasınız?

---- Hazırlık

---- 1. Sınıf

---- 2. Sınıf

---- 3. Sınıf

---- 4. Sınıf

---- Yüksek lisans

---- Doktora

3. Bölümünüz: ----------

4. Anne ve babanızın eğitim seviyesi hangi düzeydedir?

Anneniz	**Babanız**
---- Okuma yazma bilmiyor	---- Okuma yazma bilmiyor
---- İlkokul mezunu	---- İlkokul mezunu
---- Ortaokul mezunu	---- Ortaokul mezunu
---- Lise mezunu	---- Lise mezunu
---- Üniversite mezunu	---- Üniversite mezunu
---- Yüksek Lisans	---- Yüksek Lisans
---- Doktora	---- Doktora

5. Aşağıdaki etkinlikleri hangi sıklıkla yaparsınız?

	Yaklaşık her gün	Haftada yaklaşık bir kez	İki haftada yaklaşık bir kez	Ayda yaklaşık bir kez	Nadiren	Hiçbir zaman
Kitap okumak						
Gazete okumak						
Haber programları izlemek						
Belgesel ve doğa programları izlemek						

6. Aşağıdaki etkinlikleri bir yıl içinde hangi sıklıkla yaparsınız?

	Sıklıkla	Bazen	Arasıra	Hiçbir zaman
Kamp				
Açık havada yürüyüş				
Balık tutma				
Kuş gözleme				
Avcılık				

B. Sürdürülebilir Kalkınma Üzerine Görüşleriniz

1. 'Sürdürülebilirlik' ya da 'Sürdürülebilir Kalkınma' sözcükleri size ne kadar tanıdık geliyor?

a) Çok
b) Orta
c) Biraz
d) Hiç

1. soruya verdiğiniz yanıt 'Hiç' ise 6. soruya geçiniz.

2. 'Sürdürülebilir Kalkınma' ya da 'Sürdürülebilirlik' kavramlarına yönelik tutumunuzu nasıl tanımlarsınız?

a) Sonuna kadar destekliyorum.
b) Olumlu düşünüyorum.
c) Başkaları ilgilenmek isterse benim için bir sakıncası yok.
d) Hiç ilgilenmiyorum.
e) Bence boşuna zaman ve enerji kaybıdır.

3. Aşağıdaki ifadelerden hangisi "Sürdürülebilir Kalkınma" ya da "Sürdürülebilirlik" ile ilgili **kendi** anlayışınıza en yakındır?

a) Çevre korumasının ihmal edilmesi pahasına toplumun kısa, orta ve uzun vadede gerekli olan ihtiyaçlarının karşılanmasına yönelik ekonomik büyüme
b) Bireylerin kendi kaliteli yaşam anlayışlarına göre yaşayabilmelerini destekleyen bir kalkınma şekli
c) Gelecek nesillerin ihtiyaçlarının karşılanması olanaklarını tehlikeye sokmadan günümüzün ihtiyaçlarını karşılayan bir kalkınma şekli
d) Mal ve hizmet üretiminin ve bu ürünlerin kalitesindeki artışın uzun vadede sürdürüldüğü büyüme

e) Karşı karşıya olduğumuz ekolojik krizden kurtulabilmek için doğal kaynaklarımızın azalmasına engel olmayı hedefleyen sanayileşme karşıtı kalkınma

4. 'Sürdürülebilir Kalkınma' ya da 'Sürdürülebilirlik' ile ilgili kişisel anlayışınızı yansıtan anahtar kelimeler ya da sözcükler yazınız.

1.

2.

3.

5. Sizce ODTÜ kampusu sürdürülebilir yaşam biçimlerini destekliyor mu?

Evet ----------

Hayır ----------

Cevabınız 'Hayır' ise, sizce sürdürülebilir bir yaşam için ODTÜ kampusunda bu kapsamda neler yapılmalıdır?

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6. Aşağıda verilen ifadelere yönelik düşüncelerinizi belirtiniz.

	Kesinlikle Katılıyorum	Katılıyorum	Kararsızım	Katılmıyorum	Kesinlikle Katılmıyorum
a) Küresel ısınma tehlikesinin önlenmesine katkıda bulunmak için toplum olarak yaşam biçimimizde köklü değişiklikler yapmalıyız.					
b) Dünyada gelecek nesillere yetecek kadar çok doğal kaynak vardır.					
c) 'Ekolojik kriz' olarak adlandırılan olaylar fazlasıyla abartılmaktadır.					
d) Bitkiler ve hayvanlar da insanlar kadar yaşama hakkına sahiptir.					
e) Çevreye duyarlı olmayan üreticilerin ürünlerini satın almaktan kaçınmalıyız.					
f) Ekonomik koşullarım elverdiği sürece ulaşımımı kendi arabamla sağlamayı isterim.					
g) Çevreyi korumak için Türkiye'nin ekonomik alanda büyümeye ihtiyacı vardır.					
h) Türkiye'de çevre korumasının ihmal edilmesi pahasına ekonomik büyüme sürmelidir.					
i) Sadece yerel olarak yetiştirilen sebze ve meyvelerin tüketmeliyiz.					
j) Çevre koruma ekonomik büyümeye katkı sağlayabilir ve yeni iş alanları yaratabilir.					
k) Bir toplumda kültürel çeşitlilik desteklenmelidir.					
l) Doğayla daha uyumlu yaşayan toplumları örnek almak gereklidir.					
m) Yaşadığımız şehir herkesin ihtiyaçlarını karşılayacak toplu taşıma olanaklarına sahip olmalıdır.					

n) Programlarında çevre sorunlarına yer verip gerekli kanuni değişiklik ve düzenlemeleri yapabilecek siyasi partileri bu konuda desteklemeliyiz.	

7. Aşağıda verilen ifadelerden hangisi gelecekteki toplum yaşamı ile ilgili görüşünüzü belirtmektedir?

a) Teknolojik gelişmeler bütün çevre sorunlarının üstesinden gelecek ve yoksulluğu ortadan kaldıracaktır.

b) Ekolojik çöküşle karşı karşıyayız ve buna bağlı olarak ben yaşamım süresince sosyal ve ekonomik sistemlerin yıkılışına tanık olacağım.

c) Gelişmenin en iyi yolu ekolojik merkezli ve gönüllü sade yaşam değerleri ile adalet çerçevesinde yerel ekonomilerin oluşturulmasıdır.

d) Daha iyi eğitim almış yeni nesil ve en son ticari ve sosyal hizmetlerle desteklenmiş devlet politikaları, ekolojik limitler çerçevesinde yaşayan güvenli, sağlıklı ve sürdürülebilir bir toplumu oluşturucaktır.

e) Sadece güçlü otoriter bir yönetim sayesinde, ekolojik limitler çerçevesinde yaşayan güvenli, sağlıklı ve sürdürülebilir bir toplumu oluşturacak adalet ve eşitliği sağlayabiliriz.

f) Gelecekteki toplum yaşamı ile ilgili kişisel bir görüşüm yok.

8. Aşağıda önemli bulabileceğiniz bazı sosyal hedeflerin listesi bulunmaktadır. Bizim toplumumuzu dikkate alarak bu hedeflerin önemini belirtiniz.

	Çok önemli	Önemli	Biraz önemli	Önemli değil	Hiç önemli değil
a) Yoksulluğun ortadan kaldırılması	1	2	3	4	5
b) Biyolojik çeşitliliğin korunması	1	2	3	4	5
c) Herkese temel sağlık hizmetlerinin sağlanması	1	2	3	4	5
d) Eğitimle ilgili konulara daha fazla önem verilmesi	1	2	3	4	5
e) Ekonomik yatırımlar için elverişli ortamların yaratılması	1	2	3	4	5
f) Kadınlara yönelik her tür ayrımcılık ve şiddetin önlenmesi	1	2	3	4	5
g) İnsanların gereksinimlerine duyarlı demokratik kurum anlayışının yaygınlaşması	1	2	3	4	5
h) Kültürel çeşitliliğe saygı gösterilmesi	1	2	3	4	5
i) Entegre su kaynakları yönetimi ve su kullanım verimliliğinin arttırılması	1	2	3	4	5
j) Atık üretiminin en aza indirilerek yeniden kullanım ve geri dönüşüm gibi çevre-duyarlı sistemlerin geliştirilmesi	1	2	3	4	5
k) Çevre-duyarlı, maliyet açısından makul ve sosyal açıdan kabul edilebilir ulaşım imkânlarının sağlanması	1	2	3	4	5
l) Terör sorununun çözümlenmesi	1	2	3	4	5

9. Aşağıdaki ifadeleri gelecek on yıl içindeki kişisel mutluluğunuz için önemlerini göz önünde bulundurarak değerlendiriniz.

	Çok önemli	Önemli	Biraz önemli	Önemli değil	Hiç önemli değil
a) Geliri yüksek bir iş sahibi olmak	1	2	3	4	5
b) Doğada daha fazla zaman geçirebilmek	1	2	3	4	5
c) Ailemle daha fazla zaman geçirebilmek	1	2	3	4	5
d) Topluma yararlı olabileceğim bir iş sahibi olmak	1	2	3	4	5
e) Bir araba ya da ev sahibi olmak	1	2	3	4	5
f) Çevre ile ilgili bir dernekte gönüllü olarak çalışmak	1	2	3	4	5

10. Aşağıda belirtilen faaliyetleri ne sıklıkla gerçekleştirdiğinizi belirtiniz.

	Her zaman	Çoğu zaman	Bazen	Nadiren	Hiçbir zaman
a) Kısa mesafelerde motorlu taşıtlara binmek yerine yürümeyi ya da bisiklete binmeyi tercih ediyorum.					
b) İthal ürünler yerine yerel yiyecekleri satın alıyorum.					
c) Çevre koruması ile ilgili protesto yürüyüşlerine ya da gösterilere katılıyorum.					
d) Özellikle tekrar kullanılabilir ya da geri dönüştürülebilir paketlerde bulunan ürünleri satın alıyorum.					

e) Çevreye zarar veren firmaların ürünlerini satın almaktan kaçınıyorum.	
f) Yere atılmış çöpleri topluyorum.	
g) Cam şişe, alüminyum kutu ya da kağıtları geri dönüşüm kutusuna atıyorum.	
h) Daha az enerji (elektrik, su gibi) tüketmeye çalışıyorum.	
i) Odadan çıkan en son kişiysem ışıkları kapatıyorum.	
j) Dişlerimi fırçalarken ya da banyo yaparken az su tüketmeye özen gösteriyorum.	
k) Bir siyasi partiyi desteklerken ya da oy verirken çevre sorunlarının çözümüne yönelik tutumlarını da göz önünde bulunduruyorum.	
l) Çevreyle ilgili konuları içeren yayınları okuyorum.	
m) Çevreye zarar veren insanları bu tür davranışlarına son vermeleri için uyarıyorum.	
n) Çevre yanlısı harekete geçmeleri için insanları teşvik ediyorum.	

11. Aşağıda verilen ifadelere yönelik düşüncelerinizi belirtiniz.

	Kesinlikle Katılıyorum	Katılıyorum	Kararsızım	Katılmıyorum	Kesinlikle Katılmıyorum
a) İnsanlar isteklerine ulaşabilmek için doğaya müdahale etme hakkına sahiptirler.					

b) İnsanoğlu doğanın bir parçasıdır.	
c) İnsanlar doğayı kontrol etme hakkına sahiptirler.	
d) İnsanoğlu doğaya hükmetmek için yaratılmıştır.	
e) İnsanlar doğayı değiştirmektense kendileri doğaya uyum sağlamalıdır.	
f) İnsanlar her türlü eşyayı (kalem, bilgisayar vb.) tutumlu ve verimli kullanmakla yükümlüdürler.	
g) İnsanların bitkilere karşı ahlaki görev ve sorumlulukları vardır.	
h) İnsanların hayvanlara karşı ahlaki görev ve sorumlulukları vardır.	
i) İnsanların doğaya verdiği değer ne olursa olsun doğanın kendi değeri vardır.	

12. Aşağıda belirtilen konular hakkında bilgi edinmek sizi ne kadar ilgilendiriyor?

	Çok ilgileniyorum	İlgileniyorum	Biraz ilgileniyorum	İlgilenmiyorum	Hiç ilgilenmiyorum
a) Tüketim alışkanlıklarımızın değişmesi	1	2	3	4	5
b) Alternatif enerji kaynakları	1	2	3	4	5
c) Biyolojik çeşitliliğin korunması	1	2	3	4	5
d) Katı atık ve atık su yönetimi	1	2	3	4	5
e) Yoksullukla mücadele stratejileri	1	2	3	4	5
f) Sağlık koşullarını iyileştirme stratejileri	1	2	3	4	5
g) İklim değişikliği	1	2	3	4	5
h) Ormansızlaşma ile mücadele	1	2	3	4	5

) Kadınların toplumdaki yeri	1	2	3	4	5
j) Su kaynaklarının korunması ve yönetimi	1	2	3	4	5
k) Sürdürülebilir yerleşim alanları	1	2	3	4	5
l) Organik tarım	1	2	3	4	5
m) Vatandaşlık haklarımız	1	2	3	4	5
n) Kimyasal maddeler	1	2	3	4	5
o) Ozon tabakasındaki incelme	1	2	3	4	5
p) Radyoaktif atık yönetimi	1	2	3	4	5
r) Kişisel sorumluluklarımız	1	2	3	4	5

APPENDIX B

THE ROTATED COMPONENT MATRIX FOR THE PILOT STUDY

Table B.1 Rotated Component Matrix for the Pilot Study

	Component			
	1	2	3	4
SGoalD	**,900**			
SGoalJ	**,819**	,344		196
SGoalI	**,782**	,194	,104	
SGoalA	**,753**			
SGoalK	**,747**			
IGoalD	**,715**			
SGoalL	**,684**		-,109	
SGoalH	**,663**		,284	
SGoalF	**,659**			
IGoalB	**651**	-,238		
IGoalC	**,647**	-,368	-,118	165
SGoalG	**,606**			
SGoalB	**,586**			
IGoalF	**,445**	-,201		
SGoalE	**,409**			
IGoalE	**,219**			
SGoalC	**,149**			
IGoalA	**,147**			,110
BehI		**,647**		
BehA		**,567**	,255	
BehF	,164	**,549**		-,267

Table B.1 (cont'd)

BehJ	-,121	**,548**		
BehH	,106	**,527**	,205	
BehG		**,526**		
BehD		**,497**	,151	-,316
BehL	,141	**,463**		
BehB		**,412**		
BehM	,137	**,397**	,130	
BehN		**,395**		-,118
BehE		**,381**		
BehK	-,115	**,359**	,147	
Attitude F		**,315**	,215	
BehC		**,251**	,223	
AttitudeI	-,122	-,134	**,679**	
AttitudeM			**,583**	,157
AttitudeL	,125	-,346	**,518**	,186
AttitudeH	,260		**,457**	
AttitudeA			**,441**	,109
AttitudeK		-,238	**,439**	,369
AttitudeC			**,395**	
AttitudeJ			**,299**	,168
AttitudeE			**,283**	
AttitudeG		-,159	**,257**	
AttitudeB			**,148**	
ValueA		,138	-,171	**,648**
ValueG	,159	,291		**,606**
ValueC	,188		-,140	**,483**
ValueH				**,460**
AttitudeD	,106		,396	**,433**
ValueF	,227			**,397**
ValueD				**,326**

Table B.1 (cont'd)

ValueE	,112	,135		**,321**
ValueB			-,159	**,317**

- *'SGoal' refers to 'sustainability goals for future of society'.*
- *'IGoal' refers to 'sustainability goals for an individual's own life'.*
- *'Beh' refers to 'behaviors toward sustainable life styles'.*
- *'Attitude' refers to 'attitudes toward different aspects of sustainable developmet'.*
- *'Value' refers to 'values toward environment'.*

APPENDIX C

DOCUMENT OF HUMAN RESEARCH ETHICS COMMITTEE

1956

Orta Doğu Teknik Üniversitesi
Middle East Technical University

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GÖNDERİLEN: Prof.Dr. Nezih Güven
Rektör Danışmanı

GÖNDEREN : Prof.Dr.Canan Özgen
Fen Bilimleri Enstitüsü Müdürü

KONU :Elvan Şahin hk.

Ortaöğretim Fen ve Matematik Alanları Eğitimi EABD doktora programı öğrencisi Elvan Şahin'in Ocak 2008-Eylül 2008 tarihleri arasında " *Sürdürülebilir kalkınmaya yönelik yeşil bir müfredat uygulamasının getirdikleri*" başlıklı tez konusuna ilişkin Orta Doğu Teknik Üniversitesi'nde uygulama yapmak için görevlendirme başvurusu incelenmiş; ilgili danışman görüşüne dayanarak adı geçen öğrencinin isteği
doğrultusunda görevlendirilmesi Etik Komite onayı koşulu ile uygun görülmüştür.

Gereği için bilgilerinize saygılarımla sunarım.

Ek: YKK
EABD görüşü

Etik Komite Onayı

Uygundur

12/12/2008

Prof. Dr. Canan ÖZGEN
Uygulamalı Etik Araştırma Merkezi
(UEAM) Başkanı
ODTÜ 06531 ANKARA

Prof. Dr. Nezih GÜVEN
Rektör Danışmanı

APPENDIX D

THE ROTATED COMPONENT MATRIX FOR MIDDLE EAST TECHNICAL UNIVERSITY STUDENTS

Table D.1 The Rotated Component Matrix for METU Students

	Component				
	1	2	3	4	5
BehL	**.700**				
BehK	**.686**			.292	
BehM	**.669**				
BehD	**.639**			.226	
BehG	**.615**			.164	
BehN	**.610**		.229	.265	
BehF	**.572**				
BehC	**.553**		.342		.235
BehH	**.550**	.319			-.307
BehE	**.519**		.259		
BehJ	**.455**	.326			-.352
BehB	**.442**	.276			
BehA	**.361**		.191	.328	.220
BehI	**.323**				
AttitudeC		**.650**	267		-352
AttitudeL		**.586**			
AttitudeH		**.566**	271		
AttitudeM		**.524**		252	-.176
AttitudeK		**.523**			
AttitudeJ		**.484**		.255	
AttitudeA		**.465**			

Table D.1 (cont'd)

AttitudeE		**.448**	.294	.280	
AttitudeG		**.406**		.190	
AttitudeB		**.382**			
AttitudeD		**.369**			
AttitudeF		**.306**	.285	.212	
AttitudeI		**.295**			
ValueE			**.634**	.337	
ValueC			**.611**	.183	
ValueA			**.597**	.158	
ValueF			**.520**	.441	
ValueD	.164	.277	**.482**		
ValueH		.198	**.438**		
ValueG	.386		**.399**		
ValueB		.263	**.322**	.299	
ValueI		.232	**.281**		
News	.174	.452		**.617**	
Newspaper	.240	.410		**.601**	
Documentary				**.584**	
Book	.158	.216		**.399**	
Walking	.263				**.676**
Camping	.452	.280			**.671**
Fishing	.325				**.364**
Hunt		.328			**.352**
Birds					**.281**

- *'Beh' refers to 'behaviors toward sustainable life styles'.*
- *'Attitude' refers to 'attitudes toward different aspects of sustainable developmet'.*
- *'Value' refers to 'values toward environment'.*

APPENDIX E

LISREL SYNTAX FOR STRUCTURAL MODEL OF METU STUDENTS

Observed Variables

ATTITUDEC ATTITUDEH ATTITUDEL

VALUEA VALUEE VALUEC

BEHK BEHL BEHM GENDER

WALK CAMP FISH NEWS NEWSP DOCUM

Covariance Matrix From file: metu.cov

Sample Size = 960

Latent Variables: ATTITUDE VALUE BEHAVE MEDIA SEX ACTIVITY

Relationships

ATTITUDEC ATTITUDEH ATTITUDEL = ATTITUDE

VALUEA VALUEE VALUEC = VALUE

BEHK BEHL BEHM = BEHAVE

GENDER = SEX

NEWS NEWSP DOCUM = MEDIA

WALK CAMP FISH = ACTIVITY

VALUE = SEX ACTIVITY

ATTITUDE = MEDIA SEX

ACTIVITY = MEDIA SEX ATTITUDE

BEHAVE = MEDIA ATTITUDE ACTIVITY VALUE

Set Error Covariance of DOCUM and WALK Free

Set Error Covariance of NEWSP and CAMP Free

Set Error Covariance of NEWSP and DOCUM Free

Set Error Covariance of DOCUM and NEWS Free

Path Diagram

Admissibility Check = 1000

Iterations = 5000

Method of Estimation: Maximum Likelihood

Lisrel Output: EF

End of Problem

APPENDIX F

THE ROTATED COMPONENT MATRIX FOR FACULTY OF EDUCATION STUDENTS

Table F.1 The Rotated Component Matrix For FEDU Students

	Component				
	1	2	3	4	5
BehN	**.723**				
BehD	**.712**				
BehE	**.676**	.220			
BehL	**.635**				
BehL	**.626**			.220	
BehK	**.599**				
BehF	**.537**				
BehH	**.512**		.233		.334
BehG	**.453**				
BehJ	**.416**	.226	.246		.299
BehC	**.367**			.226	-.225
BehB	**.366**				.318
BehA	**.284**		.250		
BehI	**.267**				
AttitudeD		**.648**			-.222
AttitudeH		**.616**			
AttitudeK		**.610**			.216
AttitudeF		**.541**			
AttitudeL		**.541**			.280
AttitudeM		**.523**			
AttitudeI		**.473**			.307

Table F.1 (cont'd)

AttitudeE		**.451**			
AttitudeA		**.446**		.219	
AttitudeJ		**.420**			
AttitudeC		**.418**			-.346
AttitudeG		**.416**			-.219
AttitudeB		**.408**	.246		
ValueD			**.745**		
ValueC			**.688**		
ValueA			**.502**		
ValueG			**.479**		
ValueE		.227	**.360**		
ValueH			**.352**		
ValueF			**.316**		
ValueI			**.246**		
ValueB			**.235**		
News		.381		**.535**	
Newspaper		.299		**.470**	
Documentary		.260		**.460**	
Book				**.217**	
Walking	.226				**.762**
Camping	.315				**.751**
Fishing					**.741**
Hunt					**.422**
Birds					**-.388**

- *'Beh' refers to 'behaviors toward sustainable life styles'.*
- *'Attitude' refers to 'attitudes toward different aspects of sustainable developmet'.*
- *'Value' refers to 'values toward environment'.*

APPENDIX G

LISREL SYNTAX FOR STRUCTURAL MODEL OF FACULTY OF EDUCATION STUDENTS

Observed Variables

ATTITUDEH ATTITUDED ATTITUDEK

VALUEA VALUEC VALUED

BEHD BEHE BEHN GENDER

CAMP WALK FISH DOCUM NEWSP NEWS

Covariance Matrix From file: fedu.cov

Sample Size = 660

Latent Variables: ATTITUDE VALUE BEHAVE MEDIA SEX ACTION

Relationships

ATTITUDEH ATTITUDED ATTITUDEK = ATTITUDE

VALUEC VALUED VALUEA = VALUE

BEHD BEHE BEHN = BEHAVE

GENDER = SEX

DOCUM NEWSP NEWS = MEDIA

CAMP WALK FISH = ACTION

VALUE = MEDIA SEX

ATTITUDE = MEDIA

ACTION = SEX

BEHAVE = SEX MEDIA VALUE

Set Error Covariance of BEHN and CAMP Free

Set Error Covariance of BEHN and ATTITUDEK Free

Set Error Covariance of WALK and ATTITUDEK Free

Set Error Covariance of DOCUM and ATTITUDEK Free

Set Error Covariance of NEWSP and DOCUM Free

Set Error Covariance of BEHE and WALK Free

Set Error Covariance of BEHE and GENDER Free

Set Error Covariance of DOCUM and VALUEC Free

Set Error Covariance of DOCUM and ATTITUDEH Free

Path Diagram

Admissibility Check = 1000

Iterations = 5000

Method of Estimation: Maximum Likelihood

Lisrel Output: EF

End of Problem

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

Degree	Institution	Year of Graduation
MS	METU Secondary Science and Mathematics Education	2005
BS	METU Chemistry Education	2002
High School	Turgutlu Anatolian High School	1997

WORK EXPERIENCE

Year	Place	Enrollment
2002-Present	METU Department of Elementary Education	Research Assistant

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS

PAPERS PUBLISHED AT INTERNATIONAL JOURNALS

1. Yilmaz, A., **Alp, E.** (2006). Students' understanding of matter: The effect of reasoning ability and grade level. *Chemistry Education Research and Practice, 7*(1), 22-31

2. **Alp. E.,** Ertepinar, H., Tekkaya, C. & Yilmaz, A. (2006). A Statistical analysis of children's environmental knowledge and attitudes in Turkey. *International Research in Geographical and Environmental Education, 11*(3), 205-218

3. Yilmaz, A. Tuncer, G., **Alp, E.** (2007). An old subject with recent evidence from Turkey: Students' performance on algorithmic and conceptual questions of chemistry. *World Applied Sciences Journal, 2*(4), 420-426

4. **Alp, E.**, Ertepinar, H., Tekkaya, C. & Yilmaz, A. (2008). A Study on Elementary School Students' Environmentally Friendly Behaviours and Associated Variables, *Environmental Education Research, 14*(2), 129-143

PAPERS PRESENTED AT INTERNATIONAL CONFERENCES

1. Sungur, S., Yılmaz, A., Tekkaya, C., Ertepınar, H. & **Alp, E.**, (2004). Students' understanding of concept of matter: A Cross-age study. *7th Conference of Earli's Jure,* TURKEY, p. 77

2. Yılmaz, A., **Alp, E.**, Tekkaya, C. & Ertepınar, H. (2004). Investigating student's abilities to solve algorithmic problems and their understanding in chemistry concepts. *18th BCCE, Symposium Research in Chemical Education,* USA, p.197-198

3. Yılmaz, A., Sungur, S., Tekkaya, C., Ertepınar, H. & **Alp, E.** (2004) An investigation of students' performance on algorithmic and conceptual questions concerning gases. *IUPAC 18th International Conference on Chemical Education,* TURKEY, p.184

4. **Alp, E.,** Ertepınar, H., Tekkaya, C. & Yılmaz, A. (2005) Environmental knowledge and attitudes of Turkish elementary school students: The effect of gender and parents' education level. *8th Conference of Earli's Jure,* CYPRUS, p.13-14

5. **Alp, E.**, Ertepınar, H., Tekkaya, C., Tuncer, G. & Yılmaz, A. (2005). Education for sustainability: Indications of a green curriculum application in Turkey. *Joint Meeting of the 2nd Int'l Conf. on Green and Sust. Chem. and 9th Ann. Green Chem. and Eng. Conf*, USA, p.140.

6. **Alp, E.**, Ertepınar, H., Tekkaya, C. & Yılmaz, A. (2005). Environmental knowledge and attitudes of secondary school students in Turkey. *EARLI 2005- 11th Biennial Conference*, CYPRUS, p.84.

7. **Alp, E.**, Yılmaz, A., Ertepınar, H., Sungur, S. & Tekkaya, C. (2005). A Study on students' abilities to solve algorithmic and conceptual problems on chemistry concepts. *The 230th ACS National Meeting*, USA, p.136-137.

8. **Alp, E.,** Hacieminoglu, E., & Ertepinar, H. (2007). A Statistical analysis of Turkish student teachers' perceptions on teaching environmental issues. *AREF International Congress,* FRANCE.

9. **Alp, E.,** Hacieminoglu, E., & Ertepinar, H. (2007). Pre-service teachers' intended emphasis on teaching environmental issues. *National Association of Research in Science Teaching (NARST),* USA, p.152

10. Isiksal, M., **Alp, E.** & Ertepinar, H. (2007). In-service science and classroom teachers' attitudes toward inquiry-based and technology-enhanced instructional strategies. *National Association of Research in Science Teaching (NARST),* USA, p.241

11. **Alp, E.**, Isiksal, M. & Ertepinar, H. (2007). Inservice teachers' preferences between instructional strategies: Inquiry based or traditional approach", *European Science Education Research Association (ESERA)*, SWEDEN, p.174

12. Hacieminoglu, E., **Alp, E.,** & Ertepinar, H (2007). Investigation on the relationships between gender, mental capacity, reasoning ability, and chemistry achievement. 234th ACS National Meeting, USA.

13. **Sahin, E.** & Tuncer, G. (2008). Science teachers: Are they key factor for a sustainable future? The 6th International Conference Sustainable Development, Culture and Education, TURKEY, p. 35

14. Isiksal, M. & **Sahin, E.** (2008) Creative drama as an approach to the goals of education for sustainable development. All Our Futures, UK, p.34

15. Tuncer, G., Tekkaya, C., Sungur, S., Cakiroglu, J. & **Sahin, E.** (2008). Environmental literacy of future teachers: As a key for a sustainable future. XIII. IOSTE Symposium, TURKEY

16. Tuncer, G. **Sahin, E.** & Ertepinar, H. (2008). A Case on chemistry education students: Are they candidates as environmental educators? XIII. IOSTE Symposium, TURKEY

17. **Sahin, E.** Ulutas, O. Hacieminoglu, E., Ertepinar, H. (2008). An Investigation of Turkish pre-service elementary teachers' scientific literacy. XIII. IOSTE Symposium, TURKEY

PAPERS PRESENTED AT NATIONAL CONFERENCES

1. **Alp, E.**, Ertepinar, H., Tekkaya, C. & Yilmaz, A. (2006). İlköğretim öğrencilerinin çevreye yönelik tutum ve bilgileri üzerine bir çalışma. *VII. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi*, TURKEY, p.110

2. Hacieminoglu, E., **Alp, E.** & Ertepinar, H. (2006). Öğretmen adaylarının çevreye ve çevre konularını öğretmeye yönelik tutumları. *VII. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi,* TURKEY, p.113

3. Isiksal, M., **Alp, E.** & Ertepinar, H. (2006). Öğretim stratejilerine yönelik tutum ölçeği. *VII. Ulusal Fen Bilimleri ve Matematik Eğitimi Kongresi,* TURKEY, p. 256

4. Tuncer, G., **Alp, E.** & Ertepinar, H. (2007). Kimya eğitimi öğrencileri için yeni ufuklar: Çevre eğitimi. *1. Ulusal Kimya Eğitimi Kongresi*, TURKEY, p. 130

5. Doğruöz, P., Ertepinar, H. **Alp, E.** & Hacieminoğlu, E. (2007). Bilimsel işlem becerilerini kullanmaya yönelik yöntemin öğrencilerin akışkanların kaldırma kuvveti konusunu anlamalarına etkisi. *1. Ulusal Kimya Eğitimi Kongresi*, TURKEY, p. 54

6. Özsoy, İ. S., Ertepinar, H., Hacieminoğlu, E. & **Alp, E.** (2007). Sorgulamaya dayalı kimya dersinin öğrencilerin atom konusunu anlamalarına, öğrenme yaklaşımlarına, motivasyonlarına, öz-yeterliklerine ve bilimsel bilgi inançlarına olan etkisi. *1. Ulusal Kimya Eğitimi Kongresi*, TURKEY, p. 55

PROJECTS

1. Scientific Research Project (BAP-2004-05-06-04). "Elementary Science Teachers' and Biology Teachers' Attitudes toward the Environment and Environmental Knowledge" (As a researcher)

2. Scientific Research Project (BAP-2005-05-06-02). "Elementary Science and Mathematics Teachers' Attitudes and Self-Efficacy Beliefs toward Teaching Strategies" (As a researcher)

3. Scientific Research Project (BAP-2007-07-03-00-16). "Elementary Science Pre-teachers' Views on Education for Sustainable Development and Environmental Education" (As a researcher)

SEMINARS

1. Regional Environmental Center (2007). Green Pack Training of Trainers.
2. Gaia Education-METU (2007). Workshop on Sustainable Life Styles

REFEREEING

1. A referee of *Environmental Education Research* since January 2008.