FOSTERING PRE-SERVICE SCIENCE TEACHERS SELF-DETERMINED
MOTIVATION TOWARD ENVIRONMENT THROUGH SATISFACTION OF
THREE BASIC PSYCHOLOGICAL NEEDS

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF ELEMENTARY SCIENCE
AND MATHEMATICS EDUCATION

FEBRUARY 2011

Approval of the Graduate School of Social Sciences

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I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

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This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

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ABSTRACT

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February 2011, 190 Pages

The aim of this study was to examine pre-service science teachers' self-determined
motivation toward environment and investigate how their basic psychological needs
that support their self-determined motivation were fullfilled during the environmental
course activities. The thesis includes two main parts: a quantitative part and a
qualitative part. In the quantitative part of the study, PSTs' motivation toward
environment was measured before, after and five months later following the course
activities. In the qualitative part of the study, how PSTs' basic psychological needs
were supported during the course activities was examined through multiple case
study method.

The study was implemented in an environmental science course. 33 pre-service
science teachers who are taking the course participated in the study. Environmental
problems which are *Easter Island, Environment vs. Economy, Paper vs. Plastic,
Ozone Depletion, Why Worry about Extinction?, Hasankeyf and Mamak Garbage*

Dump were discussed during the six course weeks. Five PSTs, who were chosen as a focus group, were interviewed each week after course discussions. The qualitative data were collected through interviews, discussion recordings, assignments and reflection papers.

The results of the study illustrated that PSTs' self determined motivation toward environment increased after the course activities and five months later following the course. PSTs' negative capacity beliefs causing amotivation toward environment declined after the course activities and in follow up measurement. Finally, qualitative results of the study revealed that supporting cognitive and instructional features of PSTs during the course activities fullfilled their basic psychological needs and thus, fostered their self determined motivation toward environment.

Keywords: Self-Determined Motivation, Basic Psychological Needs, Pro-Environmental Behaviors

ÖZ

FEN BİLGİSİ ÖĞRETMEN ADAYLARININ ÇEVREYE YÖNELİK ÖZERK BENLİK MOTİVASYONLARININ PSİKOLOJİK TEMEL İHTİYAÇLARININ KARŞILANMASI YOLU İLE GELİŞTİRİLMESİ

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Şubat, 2011, 190 sayfa

Bu çalışmanın amacı fen bilgisi öğretmen adaylarının çevreye yönelik özerk benlik motivasyonlarını incelemek ve özerk benlik motivasyonlarını destekleyen psikolojik temel ihtiyaçlarının çevre dersi etkinlikleri sırasında nasıl karşılandığını araştırmaktır. Bu tez nitel ve nicel araştırma metodları olmak üzere iki ana bölümden oluşmaktadır. Çalışmanın nitel bölümünde, fen bilgisi öğretmen adaylarının çevreye yönelik motivasyonları ders aktivitelerinden önce, sonra ve dersten 5 ay sonra ölçülmüştür. Çalışmanın nicel bölümünde ise fen bilgisi öğretmen adaylarının psikolojik temel ihtiyaçlarının nasıl karşılandığı çoklu durum çalışması metodu ile incelenmiştir.

Bu çalışma bir çevre bilimi dersinde uygulanmıştır. Bu dersi alan 33 fen bilgisi öğretmeni adayı çalışmaya katılmıştır. 6 hafta boyunca *Paskalya Adası, Ekonomi vs. Çevre, Plastik vs. Kağıt, Ozon Tabakası Delinmesi, Nesli tükenme ile ilgili neden endişelenmeliyiz?, Hasankeyf ve Mamak Çöplüğü* isimli çevre problemleri

tartışılmıştır. Odak grup olarak seçilen 5 fen bilgisi öğretmen adayı ile tartışmalardan sonra ki her hafta boyunca görüşmeler yapılmıştır. Nitel veri; görüşmeler, tartışma kayıtları, ödevler ve yazılı yansıtıcı görüşler ile toplanmıştır.

Çalışmanın sonuçları fen bilgisi öğretmen adaylarının çevreye yönelik özerk benlik motivasyonları ders etkinliklerinden sonra ve dersten 5 ay sonra arttığını göstermiştir. Fen bilgisi öğretmen adaylarının motivasyonların düşmesine neden olan olumsuz kapasite inanışları ders etkinliklerinden sonra ve devam eden süreçte azalmıştır. Son olarak, çalışmanın nitel sonuçları, fen bilgisi öğretmen adaylarının bilişsel ve öğretimsel özelliklerinin ders etkinleri sırasında desteklenmesinin psikolojik temel ihtiyaçlarını karşıladığını ve böylece çevreye yönelik özerk benlik motivasyonlarını geliştirdiğini ortaya çıkarmıştır.

Anahtar kelimeler: Özerk Benlik Motivasyonu, Psikolojik Temel İhtiyaçlar, Çevre Dostu Davranışlar

To all my family

For their abiding love and encouragement

ACKNOWLEDGMENTS

Thank you all very much indeed.

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PST: Pre-service Science Teacher

SDT: Self Determination Theory

EE : Environmental Education

EP: Environmental Problem

REB: Responsible Environmental Behavior

EAP: Environmental Action Plan

MTES: Motivation Toward Environment Scale

AMTES: Amotivation Toward Environment Scale

DNSS: Daily Need Satisfaction

LCQ: Learning Climate Questionnaire

CCS: Classroom Connectedness Scale

EAQ: Environmental Attitude Questionnaire

CFA: Confirmatory Factor Analysis

SCA: Sense of Confidence in Action

SSI: Sense of Self Initiation

APR: Awareness of Personel Role

AEA: Awareness about Environemental Actions

CCI: Collective Construction of Ideas

SGD: Student Guided Discussion

RLC: Real Life Connection

CGD: Consistent Group Dynamic

NGO: Non Governmental Organization

CHAPTER 1

INTRODUCTION

In this chapter, I will explain significance of the study. Firstly, I will provide the information concerning why it is important to grow environmentally motivated citizens. Secondly, I will present an alternative theory in environmental education. Finally, I will give purpose, research questions and significance of the study.

1.1 The Background of the Study

Science education plays a crucial role in promotingthe understanding of the concepts about environmental issues and pro-environmental behaviors (Littledyke, 2008). Individuals who have a scientific understanding can determine their role in the ecological and sociological systems and they can analyze which behavioral changes are useful for solving the environmental problems (Darner, 2007). Many science educators claim that individuals use their scientific understanding for everyday decision making. However, few researchers focused on how everyday decision making causes pro-environmental behaviors (Darner, 2009). Even if people have deep scientific understanding to explore plausible solutions for environmental problems, they should have an impetus for behavioral change toward environment (Darner, 2007). In the field of environmental education, Hungerford and Volk (1990) reported that a person must have a desire to be actively involved in environmental behavior. How to foster this desire or impetus has been studied in environmental education (EE) for three decades (DeYoung, 2000; Hines, Hungerford & Tomera, 1986-1987; UNESCO-UNEP, 1976, 1978).

Hines, Hungerford and Tomera (1986-1987) suggested a model that indicates the variables leading to pro-environmental behaviors. These variables include attitude,

locus of control, personal responsibility, action skills, knowledge of issues, knowledge of action strategies and intention to act. When these cognitive and affective factors become more environmentally favorable, it is more likely to increase environmentally responsible behavior (Hwang, Kim & Jeng, 2000). Intention to act which is perceived as willingness to act in a certain behavior (Hines, et.al., 1986; Hungerford & Volk, 1990) is one of the important indicators of environmentally responsible behavior (Hwang, Kim & Jeng, 2000). In EE literature, the researchers generally focused on the relationship between intention to act and behavior and other variables such as locus of control yet, they made little explanations why someone has an intention to act toward pro-environmental behaviors (Darner, 2009). Therefore, it may be difficult to identify the actual pro-environmental behavior. For example, although two people have the same intention to contribute recycling, their reasons may be different. While one person may do recycling for cash refund, the other one may do it to protect the environment (Darner, 2007). These two situations are not the same and it is necessary to distinguish them in EE field (Darner, 2009). Moreover, in EE literature, positivist approaches are more dominated and behaviorism has been mostly used to cause behavior change (Darner, 2007). To emphasize environmental problems and to create long-lasting pro-environmental behaviors, an alternative theory that is self-determination theory (SDT) was proposed (Pelletier, 2004; Pelletier, Tuson, Green- Demers, Noels, & Beaton, 1998).

1.1.2   Self Determination Theory:

Self-determination theory (SDT) is a theory of human motivation and personality and it is an approach that explains the process of internalizing goals and values (Ryan & Deci, 2000a;Deci &Ryan, 2000). This theory was proposed by Deci and Ryan (1985) and it has been used empirically in many diverse domains such as education, work, interpersonal relationships, health, sports and psychotherapy (Deci & Ryan, 2004). In these different domains, SDT was used to predict various behaviors (Deci & Ryan, 2004). Moreover, it has been used to change human behavior pro-

environmentally.SDT makes a critical contribution to understanding of whether a person's behavior is internally motivated or externally motivated. When the example presented in the preceding section is considered, the person may behave externally to get a cash refund or he or she may behave internally to protect the environment (Pelletier, 2004). According to SDT, there is a continuum between extrinsic and intrinsic motivation (Ryan & Deci, 2000a). Thus, SDT gives a perspective to EE researchers to understand the reasons for individuals' pro-environmental behaviors. The pro-environmental behaviors that people show may be externally or internally motivated. According to SDT, there are different types of motivation that are classified into three categories namely intrinsic motivation, extrinsic motivation and amotivation (Pelletier, et al., 1998). Intrinsic motivation is defined as an innate tendency to engage in a behavior (Deci & Ryan, 1990). Intrinsically motivated people act with their personal choice and interest (Pelletier, et al., 1998). Intrinsically motivated behaviors are referred as prototype of self-determination (Deci, Vallerand, Pelletier & Ryan, 1991). On the other hand, people who have extrinsic motivation are encouraged with external forces. That is; they don't make any choices while doing activities and their behavior is considered to be non-autonomous (Ryan & Deci, 2000a). The goal of their behavior is either to bring positive outcomes or to avoid negative ones (Pelletier, et al., 1998). SDT points out that extrinsically motivated behavior may change and internalized (Ryan & Deci, 2000b). Hence, Deci and Ryan (1985) determined four types of extrinsic motivation that are external, introjected, identified and integrated regulation.

External regulation refers the behavior initiated by external outcomes like rewards or punishment. For instance, a student who does her homework for getting good grade or avoiding parents' punishment is externally regulated. External regulation is the least self-determined form of extrinsic motivation (Deci, et al., 1991). Introjected regulation refers to internalizing behavior with internal pressure like feeling guilt or anxiety (Pelletier, et al., 1998). For example, a student comes to class early because if she comes late, she feels bad about it since she thinks that she seems that she doesn't know her responsibility (Deci, et al., 1991). As illustrated in the example

above, the behavior is performed with internal coercion; therefore, it is a controlled behavior not self-determined (Deci, et al., 1991). Identified regulation occurs when the person performs the behavior because it is valuable. The regulatory process is a part of the self so; the person shows the behavior more willingly. For example, a student studies mathematics more than required because she believes that solving more problems will bring more success to her (Deci, et al., 1991). When identifically regulated behaviors are compared toexternally or introjectedly regulated behaviors, it is clearly seen that identifically regulated behaviors tend to be more autonomous or self-determined (Ryan & Deci, 2004).

Integrated regulation is the most advanced form of extrinsic motivation. In integrated regulation, the behavior derives from fully sense of self. Integratedly regulated behavior is related to the person's self-value system so; the person is glad to act and doesn't want any approval or appreciation for the behavior (Osbaldiston & Sheldon, 2003). The behavior that is performed with integrated regulation is fully self-determined (Deci, et al., 1991). Lastly, amotivation means the absence of motivation. People who are amotivated find the activities useless and they do not want to be active participants (Vallerand & Ratelle, 2004). Amotivation is the lowest level of self-determination (Pelletier, et al., 1998). Amotivated individuals are not certain about their actions and they could not see the motives underlying the action (Pelletier, et al., 1999). In environmental education, amotivation toward environment refers global helplessness beliefs with regard to environmental situation. Moreover, people who are amotivated toward environment think that their contribution toward environment will not make a change on a larger scale. They hesitate to act for the environment (Pelletier, Dion, Tuson, Green-Demers, 1999). Intrinsic and integrated regulation are called together as self-determined motivation and external, introjected, identified regulation and amotivation are called as nonself- determined motivation (Deci & Ryan, 1990). These self-determined and nonself-determined motivation types are indicated in figure 1.1.

Type of Motivation	Amotivation	Extrinsic					Intrinsic
Type of Regulation	Non-regulation	External	Introjected	Identified	Integrated		Intrinsic
Quality of behavior	Nonself -determined					Self-determined	

Figure 1.1 Self-determination continuum with types of motivation and types of regulation. Source: Darner, 2007 (modified version of Deci and Ryan (2004)' figure).

People who have self-determined motivation toward environment behave more voluntarily and maintain their behavior in a long term (Pelletier, 2004). To foster people's self-determined motivation, their basic psychological needs should be supported namely, the need for autonomy, competence and relatedness (Deci, et al., 1991). The need for autonomy is related to human need to feel his or her actions are derived from self not external force. (Gagne & Deci, 2005) and it refers self-initiating and self-regulating of the behavior.The need for competence refers perceiving how to attain various outcomes and feeling efficient in performing the actions (Deci, et al., 1991). When students able to handle challenging situations in school, they feel more competent (Niemic & Ryan, 2009). Competence refersa sense of confidence and efficacy in actions (Deci & Ryan, 2004, p.7). Therefore, competent people feel confident and effective while doing activities. The last one is the need for relatedness that represents to feel belonging to a group. Relatedness refers a tendency feeling connected to others and a sense of security in ones' community (Deci & Ryan, 2004; Sheldon & Elliot, 1999). The need for relatedness is the most important one because if this need is not fulfilled, individuals do not engage in activities and the relationship with the other two needs is not established (Darner, 2009). When these three needs are fulfilled, individuals become more self-determined to show pro-environmental behaviors (Pelletier, 2004, p.214). In EE classrooms, the satisfaction of basic psychological needs motivate pro-environmental behaviors (Darner, 2009).

1.2 Purpose of the Study:

In the light of the previous researches on SDT and EE, the present study was conducted to examine the environmental motivation of pre-service science teachers (PST) and determine how pre-service science teachers' basic psychological needs were supported during the environmental activities in the course.

In this study, seven specific environmental problems (i.e. Easter Island, economy vs. environment, paper vs. plastic, extinction of species, ozone depletion, a dam project, and waste problem) were given to PSTs during the six weeks. The problems were mostly related to PSTs' real life because the problems from real life allow them to see the connection between problems and everyday situations. Moreover, they were given assignments related to specific topics of each week and they prepared a project in which they proposed their solutions for a specific environmental problem at the end of the semester.

In conclusion, this study includes four specific purposes;

1) To examine pre-service science teachers' motivation toward environment during the course activities.
2) To examine pre-service science teachers' amotivation toward environment during the course activities.
3) To investigate the relationship among self-determined motivation and basic psychological needs during the course activities.
4) To understand and explore how pre-service science teachers' basic psychological needs were supported during the course activities.
5) To examine the relationship among three basic psychological needs measured in the last three weeks of the course activities.

1.3. Research Questions

This study focused on the following research questions:

RQ1: Is there a change in pre-service science teachers' motivation toward environment across the three time periods -before, after, and five-months later following the environmental activities?

This research question investigated different types of motivation (intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation and amotivation) and the changes on these motivation types of pre-service science teachers. It was investigated that whether there is an improvement on PSTs' self-determined motivation toward environment (integrated regulation and intrinsic motivation) with the environmental activities in the course.

RQ2: Is there a change in pre-service science teachers' amotivation toward environment across the three time periods -before, after, and five-months later following the environmental activities?

This research question focused on the reasons of amotivation toward environment with the AMTES scale (AMTES; Pelletier, et.al. 1999). These reasons are based on different amotivation beliefs. They are namely because of a lack of capacity beliefs, strategy beliefs, effort beliefs and because of helplessness beliefs. PSTs' amotivation beliefs were examined according to results. If PSTs'basic psychological needs are supported during the course activities, they will not feel amotivated and they will feel self-determined motivation toward environment.

RQ3: Is there any relationship between self-determined motivation and basic psychological needs that were supported during the environmental activities?

Satisfaction of basic psychological needs fosters self-determined motivation (Darner, 2007). This research question emphasized whether satisfaction of basic psychological is related to self-determined motivation or not. It was hypothesized that satisfaction of PSTs' basic psychological needs were positively related to self-determined motivation toward environment.

RQ4: Is there any relationship between need for competence, autonomy and relatedness that were supported during the environmental activities?

This research question investigates whether there is a relationship among three basic psychological needs which were supported in the course activities. However, this question was investigated in the last three weeks of the course activities in which the basic psychological needs scale was conducted.

RQ5: How pre-service science teachers' basic psychological needs were supported while solving environmental problems during the course"?

This research question seeks some features that contribute to satisfaction of students' basic psychological needs –competence, relatedness and autonomy while solving environmental problems during the course. In this way, how students' self-determined motivation was fostered or not may be understood during the activities. Based on the theory, each student's interviews, group discussions and assignments were analyzed by using constant comparative method and open coding. Eight codes and two categories were emerged from PSTs' comments. Four of the codes were taken from the study of Darner (2007) and the remaining of the codes was created from related literature (Deci & Ryan, 2004; Pelletier, 2004). Answering of this research question will help environmental educators how an environmental course may support students' basic psychological needs and in this way to develop self-determined motivation toward environment. To answer these research questions, both qualitative and quantitative methods were used.

1.4 Significance of the Study

SDT was effectively used by social psychologists to explain the reasons of pro-environmental behaviors in the general public. However, these studies were not conducted in EE settings (Darner, 2009). In the EE literature, there is a lack of study investigating students' motivation toward environment. In EE research, behaviorist perspective and positivistic approaches are more emphasized for behavioral change (Robottom & Hart, 1995). Therefore, SDT gives a new perspective to EE researchers to understand the reasons of individuals' pro-environmental behaviors (Pelletier, 2004, p.214). People who have self-determined motivation toward environment behave more voluntarily and maintain their behavior in the long term (Pelletier, 2004, p.215). The important point is to integrate environmentally responsible behaviors into people's lifestyles to protect the environment and create a sustainable world. Therefore, SDT reveals what social factors lead to such behaviors (Pelletier, 2004, p. 227). To determine these social factors, it is required to detect the EE instructional features that support students' basic psychological needs to become self-determined toward pro-environmental behaviors (Darner, 2007). Especially, children play important role because when they are motivated toward environment, they also influence their parents and their community (Pelletier, 2004, p. 227). Therefore, it is critical to educate children and develop environmental programs for the future (Pelletier, 2004, p.227). Hence, SDT guided environmental activities that support students' basic psychological needs may be implemented in EE classrooms. Therefore,teachers' role is crucial in EE. In Turkey, environmental courses are given by science teachers so, pre-service science teachers have an important role in EE as future teachers. If we give an effective environmental education to them, we can grow environmentally responsible citizens which are the main goal of EE (Culen, 1998). In an EE setting, there is limited research using SDT to promote environmentally responsible behavior. In Turkey, there was not any research examining SDT in the EE field; therefore, it is believed that this study has considerable contributions to the literature byapplying SDT into EE to raise environmentally motivated citizens. This study may be useful to encourage the

researchers who are working on the development of environmental responsible behaviors and to fill the gap in investigating pre-service science teachers' motivation toward environment. In addition, the results of this study will inform environmental educators and science teachers about the use of SDT in environmental courses to support students' basic psychological needs and foster their self-determined motivation toward environment.

CHAPTER 2

LITERATURE REVIEW

In this chapter, the background of the present study is explained in detail. Firstly, the goal of environmental education (EE) and the characteristics of environmental behaviors are described. Then, researches on pre-service teacher education and EE in Turkey are presented. Finally, the self-determination theory and its application to education and pro-environmental behaviors are explained.

2.1 The goal of EE and Environmental Behavior

In the Tbilisi Declaration (1977), it was suggested that Environmental Education (EE) should cover a lifelong education process that help individuals be prepared for life via understanding the major problems in the world and play an important role in preserving the environment. Moreover, EE should promote the individuals to be active in the problem solving process, initiative, responsible and commited to the environment (UNESCO-UNEP, 1978). The goal of environmental education is to raise people who are aware of the environment and environmental problems and have knowledge, attitudes, motivations, skills and commitment to protect the environment (UNESCO-UNEP, 1976).The categories of EE goals were presented in Tbilisi Declaration (1977) and they are presented in table 2.1.

Table 2.1 EE goals and descriptions

Source: Tbilisi Declaration (1977)

EE goals' categories	Descriptions of goals
Awareness	*to help social groups and individuals acquire an awareness and sensitivity toward to the total environment and its allied problems.*
Knowledge	*to help social groups and individuals gain a variety of experience in and acquire a basic understanding of the environment and its associated problems.*
Attitudes	*to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation actively participating in environmental improvement and protection.*
Skills	*to help social groups and individuals acquire the skills for identifying and solving environmental problems.*
Participation	*to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems.*

According to these goals, an environmentally responsible person has an awareness and sensivity of environment, a basic knowledge to understand the environment and environmental problems, feelings of concern, motivationtoward environment, some skills to solve the environmental problems and lastly active participation in studies on environmental issues (Hungerford & Volk, 1990). The variables shaping responsible environmental behavior (REB) are shown in figure 2.1.

```
┌─────────────────────────────────────────────┐
:    Responsible Environmental Behavior        :
:                  (REB)                        :
└─────────────────────────────────────────────┘
                      │
                      ▼
┌─────────────────────────────────────────────┐
:    Awareness  Sensivity Knowledge            :
:    Concern   **Motivation**  Skills           :
:    Active Participation                       :
└─────────────────────────────────────────────┘
```
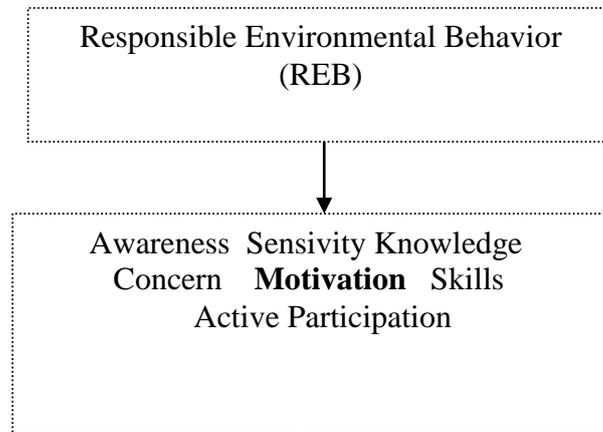
Figure 2. 1 The variables shaping responsible environmental behavior (REB).
(Motivation in bold faced is one of these variables)

The traditional thinking in environmental education is that individuals who have more knowledge about the environment become more aware of environmental issues and more motivated toward environment. Another traditional thinking is that there is a relationship between knowledge and attitude toward environment. That is; increased environmental knowledge causes positive attitudes toward environment and later into action (Hungeford & Volk, 1990). However, this linear relationship is not sufficient to explain REB (Hungeford & Volk, 1990).

EE researchers have developed different frameworks that explain the gap between environmental knowledge, environmental awareness and environmental behavior but no certain answers were found. An early model from 1970s suggested that environmental knowledge leads to environmental attitude and then pro-environmental behavior. However, it was found that this connection among environmental knowledge, attitude and behaviour was not true (Kollmus & Aggyeman, 2002). While many researchers supported this relationship (e.g. Arbuthnot, 1977; Vining & Ebreo, 1990), many of them failed to explain it (e.g. Gill, Crosby & Taylor, 1986; Oskamp, Harrington, Edwards, Sherwood, Okuda & Swanson, 1991). Most of the studies showed that even if people have pro-

environmental attitudes toward environment, they hardly take action (De Young, 2000; Finger, 1994; Pelletier, et al., 1998; Stets & Biga, 2003). Oskamp (1995) also asserted that there is a low positive relationship between pro-environmental attitude and pro-environmental behavior. In conclusion, this early linear relationship does not explain REB and there is not just one factor affecting REB (Oskamp, 1995). Therefore, Hines, Hungerford and Tomera (1986-87) suggested a more complex REB model. They reached to their results conducting a meta-analysis with 128 studies. A small number of these studies focused on attitude, locus of control/self efficacy, moral responsibility, behavioural intention and pro-environmental behavior (Bamberg & Möser, 2007). The model prepared by Hines, Hungerford and Tomera's model is shown in Figure 2.2.
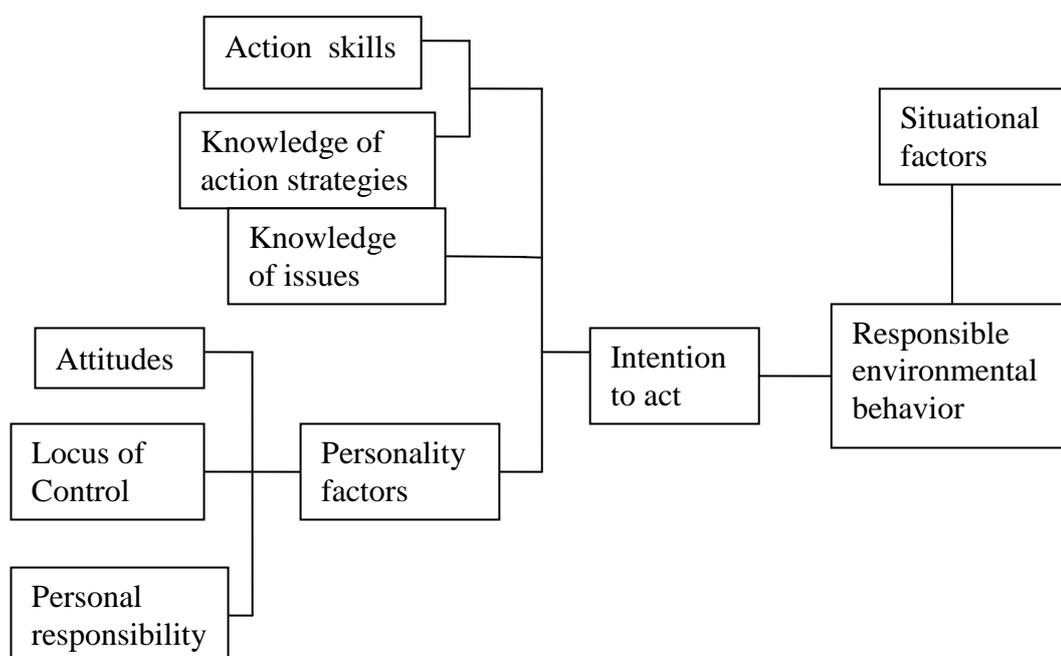
Figure 2.2 The Hines model of responsible environmental behavior
Source: Hines et al., 1986/87.

With respect to this model, there are many different variables affecting REB. One of these variables is locus of control, which is worth to be examined in detail. Locus of control is defined as "individual's belief in being reinforced for a certain behavior"

(Hungerford & Volk, 1990). There is internal and external locus of control. People with external locus of control believe that their actions may have little impact on outcomes and there is a few thingsthat they can do to to change them. For instance, a person who believes that he or she is powerless to change her or his behaviors toward environment will not act to make changes in his or he behavior toward environment. This person has an external locus of control to help solve the environmental problems (Hungerford & Volk, 1990).On the other hand, people with internal locus control believe that their actions are guided by their decisions and under their own control (Pintrich & Schunk, 2002). Furthermore,a person who has an internal locus of control believes that he or she will be successful to do something (Hungerford & Volk, 1990). Internal locus of control which is also an important variable to predict pro-environmental behaviors (Culen & Volk, 2000; Kollymus & Agyeman, 2002; Hsu, 2004; Newhouse, 1990) may be improved in the EE classrooms (Darner, 2007).

The intention to act which covers locus of control is another variable predicting pro-environmental behaviors. An individual who has an intention to act will more likely to be active for the environment and has more willingness to act on a behavior (Hines et al., 1986/1987). Locus of control is found to be the best predictor of intention to act (Hungerford & Volk, 1990; Hwang, Kim & Jang, 2000). More specifically, Hwang et al. (2000) reported that internal locus of control is a core variable that develops the intention to act for REB (Hwang, et al., 2000). They also suggested that to enchance intention to act in EE classrooms, it is required to stimulate the locus of control.

Hungerford and Volk (1990) examined environmental behavior and related variables in three categories, which are entry level, ownership level and empowerment level. They pointed out that locus of control and intention to act are called as empowerment variables in their model. Morever, they reported that empowerment is like a cornerstone in EE. However, this variables are not emphasized sufficiently in environmental education studies (Hungerfod & Volk, 1990). As internal locus of control mostly influence the intention to act, it can be stimulated in EE classrooms to

promote intention to act with various environmental programs(Hwang, et al., 2000). As the intention to act has also a direct effect on the behavior (Ajzen, 1991), it may be developed in EE classrooms (Darner, 2007). Moreover, there are several factors that foster intention to act in EE classrooms (Darner, 2007). One of them is that students should be active participants in the classrooms (Hewitt, 1997; Zelenzy, 1999).Gardner and Stern (1996) reported that environmental interventions may be effective to change pro-environmental intentions. Moreover, long term EE programs have more effect to make change on behavior than short term programs (Zelenzy, 1999). Community based activities (school wide recycling programs) also foster intention to act in EE classrooms. Nevertheless, EE literature does not explain why someone has a potential intention to act or what may be the reasons of having it. For instance, two people may have the same intention to contribute to recycling, yet they may express different reasons of intention to act. One person may recycle for cash refund; however, another person may recycle to protect the environment (Darner, 2007). To put it differenlty, people may have external or internal reasons to take action for the environment.

Furthermore, Robottom (1995) reported that behaviorist perspective is more emphasized and positivist approaches are commonly employed for behavioral change in EE literature. However, to create effective and long lasting solutions for the environment and better understand human environmental behavior, people's cultural ways of understanding and socio-contextual environment should be considered (DeYoung, 2000; Robottom & Hart, 1995). When all these issues are considered, it seems obvious thatan alternative theory is required in order to understand the reasons of people' intention to act and foster environmental motivation in the classrooms. This theory was proposed by social psychologists as Deci and Ryan's self-determination theory (SDT) to promote changing human behavior pro-environmentally (Deci & Ryan, 2004). This alternative theory is explained explicitly in a different subtitle.

2.2 Research on Pre-service Teachers and Environmental Education

This study was performed with pre-service science teachers in an environmental science course. In order to provide an effective EE, teachers should be knowledgeable about the environment and environmental problems (Schmidt, 1996). Disinger (2001) stated that pre-service and in service K-12 teachers play a critical role in raising environmentally concerned people. There are some efforts to improve teacher education to integrate EE into the K-12 curriculums (Disinger, 2001). Plevyak, Bendixen- Noe, Henderson, Roth and Wilke (2001) investigated the effectiveness of EE programs in teacher education programs and found that pre-service teachers who participated in EE programs teach environmental issues more confidently than pre-service teachers who do not take EE. Petegem, Blieck and De-Pauw (2007) conducted a case study with two teacher education colleges. They carried out five years EE program with teachers to increase their knowledge and experience about the environment and motivate them to EE . After five years, this program was integrated into the curriculum, science teachers and even non-science teachers felt more competent and commitment to EE. In addtion, teachers who are taking professional development experience in EE had higher teaching efficacy and outcome expectancy related to environment (Moseley, Huss & Utley, 2010). These studies are necessary to prepare K-12 teachers as an effective environmental educators. Above-mentioned studies have presented that EE implementations are effective to train future teachers to be good environmental educators. Therefore, this study focused on EE in pre-service science teachers and how to foster their motivation toward environment in the classrooms.

2.3 Research on EE in Turkey

In this part of the chapter, EE researches carried out in Turkey are presented and characteristics of EE in Turkey are discussed. A great deal of studies related to different environmental variables were conducted in Turkey. For instance, a study

conducted by Yılmaz, Boone and Andersen (2004) to investigate Turkish elementary school students views with regard to environmental issues covered in national curriculum and determine how these views differ by gender, grade level, previous science achievement, socio economic status (SES) and school location. The results of the study revealed that students who were more successful in science courses showed more positive attitudes toward environmental issues than students who were not. Also, 4th, 7th, 8th grade srudents exhibited more positive environmental attitudes than 5th and 6th grade students. Moreover, according to results, there was not gender difference in elementary school students. However, female students were more concerned about environmental issues than male students in middle schools. Students in high family income and living in urban areas displayed more positive attitudes toward environment than students in low family income and living in suburban areas.

Another study conducted by Tuncer, Ertepınar, Tekkaya and Sungur (2005) was about Turkish elementary school students' attitudes toward environment. They found that Turkish elementary school students have positive attitudes toward environment and also female students expressed more positive attitudes toward environmental problems and solutions than male students. They also explored that students enrolled in private school had a higher awareness compared to students enrolled in public schools.

Moreover, Tuncer, Sungur, Tekkaya and Ertepınar (2007) studied both elementary school students' and pre-service teachers' environmental attitudes. They reported that pre-service teachers are more aware of the environmental problems and more optimistic about solutions of the problems than elementary school students. Turkish elementary school students also showed positive attitudes toward environment; however, they do not have sufficient information to protect the environment.

A similar study conducted by Özden (2008) was about awareness and sensibility of Turkish student teachers' regarding environmental issues. The results of this study revealed that female students in high socio-economic status and living in Marmara

region had more positive attitudes toward environment. Moreover, elementary student teachers exhibited more positive attitudes toward environment than mathematics and social student teachers. The study implied that rich student teachers and living in urban areas had more positive attitudes toward environmental problems than poor and average student teachers and living in rural areas.

In another study conducted by Alp, Ertepınar, Tekkaya and Yılmaz (2008), Turkish elementary school students' environmental knowledge, behavioral intentions, environmentally friendly behaviors, environmental affects and locus of control and the relationship environmentally friendly behaviors and other variables were investigated. The results displayed that students have limited environmental knowledge such as recycling, water and energy usage, or environmental pollution. However, they have relatively favourable attitudes toward environment. Their lack of knowledge did not show any negative affect on their willingness to preserve the environment. Moreover, students' knowledge about the environment was not dependent on gender but, the effect of gender is significant on students' attitudes toward environment in favor of girls. They also reported that environmentally friendly behaviors can be predicted by behavioral intentions, affects, environmental knowledge and locus of control. However, they did not find a positive relationship between environmental knowledge and pro-environmental behaviors. Similarly, a person's intention to act was found poorly related to pro-environmental behaviors. While Turkish elementary school students had a high emotional feelings for the environment, they did not have willingness to take action for the environment. On the other hand, the study displayed that locus of control had a direct significant effect on pro-environmental behaviors.

Yurttaş and Sülün (2010) studied with pre-service science teachers ans they examined obtained information sources about environmental problems of pre-service science teachers and their perceptions about the most environmental problems in their city, in Turkey and in the world. They conducted interview including multiple choice and close-ended questions. They reported that pre-service science teachers

mostly obtain information about environmental problems from media and people in their community. Moreover, they found that according to pre-service science teachers, air pollution is the most important problem and water pollution and lastly wastes.

A recent study conducted by Erdoğan, Marcinkowski and Ok (2009) was about content analsyis of selected features of K-8 environmental education in Turkey. They examined 53 studies that were conducted between 1997-2007. They reported that most of the researchers focused on students' ecology knowledge, knowledge of environmental issues, problems and affective domains toward environment. Students' attitudes were investigated with respect to historical environment, waste management, environmental problems, endangered species and threatened ecological environment. However, there are limited studies that were conducted regarding cognitive skills, socio-political-economical knowledge and responsible environmental behaviors in Turkey.

In summary, most of the EE studies in Turkey focused on environmental knowledge and attitude and they were performed with elementary school students and pre-service science teachers. Some of these studies showed that there was not a consistent relationship between environmental attitude and knowledge. In EE literature, there are limited studies emphasized on responsible environmental behaviors and the variables that affect REB such as behavioral intention, locus of control and motivation. Moreover, most of the EE studies in Turkey are based on quantitative research methods. Qualitative studies in EE have recently gained importance. Therefore, in the current study, evironmental motivation of pre-service science teachers was examined both qualitatively and quantitatively.

2.4 Research on Self-Determination Theory in Education

Self-determination theory (SDT) was proposed by Deci and Ryan (1985) as an approach to explain human behavior and motivation.The central feature of self

determination theory is to develop inner resources for personality development and behavioral self regulation (Ryan, Kuhl & Deci, 1997). SDT presents an assumption that inherent capacities and tendencies develop people's sense of self and the theory accepts this innate tendency and capacity as a basic aspect of human life (Deci & Ryan, 2004, p.5). SDT distincts human behavior as self determined or controlled. According to theory, motivated actions are self determined that are regulated volitionally and directed by sense of self. In contrary, controlled actions are compelled by interpersonal or external force (Deci & Ryan, 1991). A self determined behavior represents internal locus of causality whereas a controlled behavior refers external locus of causality. All these behaviors are motivated or intentional yet, their regulation process is different (Deci, Vallerand, Pelletier & Ryan, 1991). Self determined actions are at the center of the intrinsically motivated behaviors because both of them comes from self. On the other hand, according to SDT, extrinsically motivated behaviors are self determined through integration and internalization (Ryan & Deci, 2000a). However, this internalization does not reveal automatically. People synthesize cultural demands, values and regulations and they connect them into the self. To create internalization, basic psychological needs also should be supported (Deci & Ryan, 2000). Satisfaction of relatedness, autonomy and competence are essential for internalization of behaviors(Gagne & Deci, 2005).

The autonomy and competence support are critically important for intrinsic motivation and interest. Individuals display intrinsically motivated behaviors in freely engagement and do not need external outcomes. Moreover, satisfaction of basic psychological needs (relatedness, autonomy and competence) enhance intrinsic motivation. However, using external outcomes thwarts intrinsic motivation (Deci & Ryan, 2000). According to a meta analysis of 128 studies indicated that monetary rewards and tangible rewards diminish intrinsic motivation (Deci, Koestner & Ryan, 1999). Furthermore, external outcomes like rewards, threats thwart autonomy and lead to decreased intrinsic motivation, less creativity and low problem solving. However, if individuals are allowed to make choices freely and their feelings are

accepted, their sense of self initiation that causes satisfaction of need for autonomy can be improved (Deci & Ryan, 2000).

In the literature, SDT was used in many different areas including education, work, relationship, physical activity, health, environmental issues and psychotherapy. Studies conducted in these areas displayed that autonomy supported environment fosters self determined motivation (intrinsic motivation and integrated regulation) (Vallerand, Pelletier & Koestner, 2008). Self determined motivation was related to diverse eduational outcomes from elementary school to university students. These studies have indicated that students who had higher self determined motivation more stay at school and do homework than students who had lower self determined motivation (Vallerand & Bissonnette, 1992).Besides,intrinsically motivated behaviors place in the core of SDT (Ryan & Deci, 2000a).According to SDT, to sustain intrinsic motivation, students' basic pscyhological needs for autonomy and competence should be supported. If students feel autonomous in the classrooms, they devote more time and energy to the tasks. Moreover, if they feel competent, they are able to overcome the challenges in their studies. Both of these needs should be satisfied to foster intrinsic motivation (Niemic & Ryan, 2009).

In the SDT field, several studies were conducted to assess students' intrinsic motivation. In a study conducted by Jang, Reeve and Ryan (2009) showed that when needs for autonomy and competence of South Korean public school students were supported, they felt more intrinsically motivated. Moreover, Niemic and Ryan (2009) reported that autonomy supportive teachers foster students' intrinsic motivation and lead to deeper learning whereas more controlled teachers decrease intrinsic motivation (Niemic & Ryan, 2009).

Similarly, Grolnick and Ryan (1989) found that elementary school students who are learning in an autonomy supportive environment have higher intrinsic motivation, perceived competence and self-esteem than did students who are learning in a controlled environment.Moreover, Lavigne, Vallerand and Miquelon (2007)explored

that teachers who support students' basic psychological needs in science classrooms have a direct effect on students' motivation toward science and they found that the students who have more self-determined motivation have more intention to pursue a career in a scientific field.

Furthermore, according to SDT, extrinsic motivation is distincted as less autonomous to more autonomous. Both identified regulation and integrated regulation are perceived as more autonomous than external and introjected regulation (Niemic & Ryan, 2009). In a study, Black and Deci (2000) examined autonomy support and autonomous motivation of college students on learning organic chemistry course. They found that students who had more autonomous motivation during the course indicated more positive experiences, higher success and higher competence in the course. Therefore, internalization of extrinsic motivation satisfies students' self initiation and volition for attending educational activities that are not interesting (Niemic & Ryan, 2009). SDT also posits that classroom environment supporting students' needs for competence, autonomy and relatedness leads students to more internalize their motivation to learn (Niemic & Ryan, 2009). In addition to needs for autonomy and competence, the need for relatedness fosters students' motivation (Furrer & Skinner, 2003). In educational studies, many researches were performed to explore the impact of students' need for relatedness in the classrooms and schools (Battistich, Solomon, Kim, Watson, & Schaps, 1995;Roeser, Midgley, & Urdan, 1996; Wentzel, 1998). Students who feel connected at school show effort, persistence, participation and positive emotions like interest and enthusiasim. On the other hand, students who feel disconnected rarely involve in academic activities, feel bored, worried and frustrated. Satisfaction of need for relatedness also affect students' academic engagement (Furrer & Skinner, 2003). Children whose need for relatedness was satisfied felt more confident, coped with the tasks, worked harder and showed better performance in the classrooms (Ryan et al., 1994).Furthermore, Furrer and Skinner (2003) found that middle school children' satisfaction of need for relatedness affect positively their academic motivation and performance. Also, they explored that there was an effect of relatedness on social partners such as parents,

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teachers and peers. They reported that older children had lower relatedness to teachers. Teacher, parent and peer support promote students' feelings of belongingness and connectedness and develop their success and participation in the classrooms (Furrer & Skinner, 2003).

In summary, different kind of studies guided by SDT were conducted in educational settings. These studies implied that to foster self determined motivation (intrinsic motivation and integrated regulation) in the courses, basic psychological needs (autonomy, competence and relatedness) should be satisfied. Teachers should be more autonomy supportive in the classrooms. When students' basic psychological needs were supported in the courses, they more likely engaged in tasks, coped with challenging situation, showed better performance and became more successful.

2.5 Research on SDT and Pro-environmental Behaviors

Environmental programs emphasize two important points. First, they mention about changing people's attitudes; therefore, they convince individuals about that the problem is serious and crucial to solve. Second, they point out the specific actions that people should take for solving the problem. In order to solve the problem, motivation for participating in action is necessary. Moreover, knowing about specific actions for the environment is expected to satisfy need for competence of individuals. It means that people should be aware of environmental behaviors and feel competent to activate pro-environmental behaviors (Pelletier, 2004, p.207).

Furthermore, Oskamp (1995) asserted that self efficacy or perceived control affects the relationship between environmental concern and environmental behaviors. It means that if people do not know what they can do for the environment or do not believe to change the situation, they are unlikely to show pro-environmental behaviors (Pelletier, 2004, p.209). These two factors as perceived control and perceived competence are necessary to show pro-environmental behaviors but, they are not sufficient.

In the literature, it was argued that incentives may be used to create pro-environmental behaviors. However, incentives have a short term effect on pro-environmental behaviors. When rewards or punishments are removed, people discontinue REB. Therefore, incentives are not effective to sustain pro-environmental behaviors in a long term (Pelletier, 2004, p.210). On the other hand, the important thing in EE is to create long term pro-environmental behaviors. In orderto create long term pro-environmental behaviors and sustain these behaviors, SDT was suggested (Pelletier, 2004; Pelletier, et al., 1998). It was claimed that self determined behaviors may be continuous even if external incentives were absent (Pelletier et al., 1998). SDT was used in many different domains. In the environmental domain, this theory may be used to develop pro-environmental behaviors (Pelletier, 2004).

In the environmental studies, researchers investigated the relationship between different types of motivation and pro-environmental behaviors like recycling, purchasing specific products etc. Particularly, the studies regarding SDT applied to pro-environmental behaviors were conducted in psychology areas. The researchers displayed that self determined motives (intrinsic motivation, integrated regulation and identified regulation) have a high relationship with the frequency of pro-environmental behaviors. For instance, in a study, Green-Demers, et al. (1997) investigated the relationship between self determined motivation and the occurence of pro-environmental behaviors and they conducted a study with 492 university students. They examined three different pro-environmental behaviors that are recycling, purchasing environmentally friendly products and educating oneself for the environment. The results showed that the frequency and difficulty of behaviors was affected by the level of SDT. When the level of SDT was high, the frequency of pro-environmental behaviors increased and also students performed even difficult behaviors such as educating oneself for the environment. In conclusion, self determined behaviors are more likely frequent and being maintained even the

behavior is difficult (Pelletier, 2004, p.215). So as to increase pro-environmental behaviors, self determined motivation should be fostered. (Pelletier, 2004).

In the literature, there are also studies examining perceptions of environmental health risk that is the determinants of REB. These studies focused on the relationship between self determined motivation, perceptions of environmental health risks and pro-environmental behaviors (Pelletier, 2004, p.218). For instance,Seguin, Pelletier and Hunsley (1999) investigated the contribution of self determined motivation and perceptions of health risks to pro-environmental behaviors of 761 residents. They found that the more people have self determined motivation for the environment the more they show pro-environmental behaviors. In other words, the more people engage in the activities with personal interest, the more they behave pro-environmentally (Seguin, et al., 1999).Moreover, self determined motivation leaded people to find out information on environmental health risks. They reported that participants did not trust regional goverments and industry as a source of information on environmental health risks but, they more trusted federal goverments because regional goverments did not deal with environmental issues effectively (Soden, 1995).On the other hand, federal goverments informed public how to deal with environmental health risks (Soden, 1995). Therefore, people more relied on federal goverments. This confidence in federal goverments leaded more concern about environmental health risks and in this way, people were more motivated for pro-environmental behaviors. Seguin et al. (1999) claimed that people who have self determined motivation toward environment have made more research for information on environmental health risk and this has caused more frequent pro-environmental behaviors. As a result, self determined motivation and information about environmental health risks are important determinants and predictors of pro-environmental behaviors (Seguin et al., 1999).

Social psychologists also outlined social and contextual factors in the environmental domain that support self-determination. They asserted that some aspects of social context that are satisfaction, importance, concern or other perceptions about the environment affect self-determination (Pelletier, 2004, p.221). These aspects support

people' basic psychological needs that are competence, autonomy and relatedness. If social or interpersonal behaviors of other people in their environment foster competence, they efficiently interact with the environment and show pro-environmental actions. Moreover, when their sense of autonomy was supported by others, they want more probably to engage in activities that they chose and they play a role at the center of the action (Pelletier, 2004).

Lastly, when they get support of others and see others concerning for the environment, they feel a great connectedness to them (Pelletier, 2004). Furthermore, both organizational factors like goverment's approach to the environmental programs and strategies and behaviors of people in the community affect motivation toward environment (Pelletier, 2004). Deci and Ryan (1991) asserted that satisfacton or undermning of basic psychological needs influence people' motivation and self determination.

If people know what actions they should take for the environment and why they should take, they will also know how they should act for the environment. This issue refers a crucial need that is the need for competence (De Young, 2000). Competence need is a main source of motivation and play an important role in behavioral change (White, 1959; De Young, 2000). To increase self determined pro-environmental behaviors, these basic psychlogical needs should be supported (Darner, 2007).

In the literature there are also some studies regarding motivation and basic pscyhological needs conducted by social psychologists. For instance, Pelletier, Dion, Tuson and Green-Demers (1999) investigated the reasons of lack of motivation toward pro-environmental behaviors and studied with 600 residents. The study revealed that there may be different reasons for lack of motivation and these reasons are associated with different amotivation beliefs (effort, strategy, capacity and helplessness beliefs). One of them is strategy beliefs. It means that some people may believe environmental strategies are ineffective to help the environment. The second belief is capacity beliefs. It claims that some people may believe they do not have

enough capacity to perform the environmental behavior. The third belief is effort belief. It means that some people may believe that they do not make enough effort to change their behaviors. Laslty, they may feel helpless to improve the environment. The results indicated that there is a negative relationsip between need for competence and types of amotivation beliefs. In other words, if individuals' need for competence is not satisfied, they feel amotivated toward environment because they have lack of capacity beliefs and helplessness beliefs. Pelletier et al. (1999) also suggested that to reduce amotivation, people should be given proper knowledge and skills about how to act for the environment. In this way, their awareness of the environmental problems and their need for competence increase and amotivation decreases. Besides, Deci and Ryan (1991) reported that if need for autonomy is not supported in the environment, amotivation and helplessness beliefs will increase.

In another study, Pelletier et al. (1998) developed a scale to assess motivation toward environment. It was the inital assesment of motivation toward environment. During its development, firstly, they studied with 412 university students and developed motivation toward environment scale (MTES). They found six subscales namely intrinsic motivation, extrinsic motivation, integrated regulation, introjected regulation, identified regulation and amotivation.Secondly, they studied with 544 participants to confirm factorial structure of the MTES. Finally, they administered MTES with different psychological constructs with 310 university students. These psychological constructs were internality, powerful others, chance scales, self esteem scale, environmental attitude scale, environmental satisfaction scale, perceived importance and perceived competence for environmental problems, frequency of environmental behaviors and social desirability. They found that internal locus of control and self esteem were positively related to self determined motivation.Powerful others, chance scales were negatively related to self determined motivation and positively related to non-self determined motivation. Environmental attitudes, perceived importance and competence for environmental issueswere positively related to self determined motivation and self determined motivaion was negatively related to environmental satisfaction. MTES was not related to social

desirability. Self determined motivation types (intrinsic, integrated and identified regulation) were significantly related to environmental behaviors but, the correlation between non-self determined motivation types (introjected, external and amotivation) and environmental behaviors are nonsignificant or negative. As a result, they asserted that individuals behave for the environment because of different reasons. Some of them behave environmentally for pleasure and satisfaction and some of them behave for external reasons. They also reported that there was a negative relationship between human satisfaction and self-determined motivation. Self-determined individuals were dissatisfied with the situation of the environment that include environmental problems; therefore, they feel competent to help solve these problems and be more activist. On the contrary, non-self determined people are satisfied with the current situation of the environment and they do not feel competent to solve the problems. Therefore, they do not engage in environmental behaviors. This study also displays the internalization of extrinsic motives by separating intrinsic motivation and different types of self determined extrinsic motivation (identfied and integrated regulation). This scale may be useful to determine which different types of motivation best predict pro-environmental behaviors (Pelletier, 2004, p.213).

In a different study conducted by Moller, Ryan and Deci (2006), some specific strategies which motivate the behavior were suggested. These were environmental conservation and promoting of healtier behavior. These strategies may be effective to promote autonomous motivation in a public policy domain. If the autonomous motivation was supported, people would perform the behavior more and facilitate internalization. Hence, it is important to satisfy the need for autonomy to develop pro-environmental behaviors (Moller et al.,2006).

Recently, In EE setting, an initial study was performed by Darner (2007). She designed an environmental biology course at college level guided by SDT and tried to foster students' basic psychological needs during the course. She measured students' self determined motivation toward environment before, after and five months following the course and found a positive change in students' environmental

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motivation. She founded that to foster motivation toward environment,students should feel that they are cared for, connected to others and they can trust others while solving problems. Besides, she identified several classroom features that support or undermine students' basic psyhological needs in the course. This study was a first step because it includes self-determination theory applying to formal environmental education.

Another study in EE setting was conducted by Legault and Pelletier (2000). They investigated sixth grade students' and their parents' environmental knowledge, attitude, motivation and behavior after an environmental education program that includes basics of an ecosystem, endangered species and ways for protecting and respecting environment. 184 children and 131 parents participated in the study. It was concluded that children showed ecological behaviors for less extrinsic reasons and parents of children' dissatisfaction with the environment increased. Past researches also showed that when dissatisfaction with the environmental situation increased, self-determination and ecological behaviors increased (Green-Demers et al., 1997). There was not found any significant differences for other measures. By means of environmental education, children may be effective to motivate behavioral changes in parents (Legault & Pelletier, 2000). Moreover, teachers who are highly commited to the environment and interested in environmental issues may communicate with their students in a great enthusiam regarding environmental issues (Hungerford & Volk, 1990).The development of EE programs to educate children is critically important for future (Pelletier, 2004). Therefore, the core element of this study was pre-service science teachers.

In summary, SDT was mostly studied by social psychologists to motivate pro-environmental behaviors. Above-mentioned studies showed that the researchers focused on general public from university students to residents in a town. They investigated various factors that foster or thwart self determined motivation toward environment and they examined how people's basic psychological needs may be supported to develop self determined environmental behaviors. These studies

adduced that SDT may be effectively used to promote pro-environmental behaviors. In EE settings, there is limited studies investigating SDT to foster pro-environmental behaviors. Darner (2007)'s study is an example of SDT application in a formal EE setting and she compared SDT guided and non-SDT guided environmental biology courses. Her study revealed how to be the features of an instructional environment guided by SDT. Based on literature, there are not any study investigating self-determined motivaion of pre-service teachers. To grow autonomy supportive teachers in EE classrooms, this kind of studies are required. This study was carried out also for this reason. Teachers should learn how to support students' basic pscyhological needs and foster their self determined motivation toward environment. As a result, these studies indicated that to develop long term pro-environmental behaviors and increase the frequency of these behaviors, individuals' self determined motivation toward environment should be supported.

2.5.1 Satisfaction of students' basic psychological needs in the EE Classrooms

There are some socio-contextual factors supporting basic psychological needs in the classrooms and leading to self-determined behaviors (Deci & Ryan, 1990; Deci & Ryan, 2000a; Reis, et al., 2000; Ryan & Deci, 2000b;Sheldon & Elliot, 1999). These basic psychological needs should be supported in EE classrooms to promote self determination toward pro-environmental behaviors (Darner, 2007). These factors themselves are irrelevant if the perceptions of the person/people under study are not taken into account. In other words, a person must perceive that she or he is competent, autonomous, and related, and these perceptions are the ones that allow for self-determined motivation (Deci & Ryan, 2004). One of the basic psychological needs is autonomy need. Autonomy support is necessary to promote internalization and self-determination (Grolnick & Ryan, 1987).In order to satisfy need for autonomy, it is crucial providing choices and supporting feelings that foster self initiation and cause positive outcomes (Deci & Ryan, 2000). Thus, when people self initiated their behavior, they feel more autonomous and intrinsically motivated for the activity because their behavior comes from self not an external force (Deci,

Eghrari, Patrick & Leone, 1994). In order to support students' need for autonomy in EE classroom, environmental action plans (EAPs) may be effective since they give opportunity to students to solve the problem that they chose. Students make their own decisions what actions they should take for the environment instead of telling them what they should do (Darner, 2007). Moreover, guidance of the instructor during the discussions rather than directly giving solutions fosters need for autonomy in the classrooms (Darner, 2007).

Bandura (1989)reported that the combination of environmental factors and personal characteristics influence inividuals' beliefs about the outcomes of the study and their abilities allowing to complete tasks competently (Bandura, 1989). In order to support need for competence, students should feel sense of confidence and effectance in the task (Deci & Ryan, 2004, p.7). When they feel confident, they want to participate in the task and they can be successful. If students do not believe that they can be succesful in the task, they will not feel competent. Besides, need for competence may be supported if students understand the ecosystems that include human and perceive that problems are connected to real life. When they understand human as part of an ecosystem, they can perceive that human actions are effective in environmental solutions (Darner, 2007). Furthermore, when individuals see the connection between the problems and everyday situations, they consider their real life and focus on what would be better for the environment (Darner, 2007). Environmental problem solving in class promotes students to seek environmental solutions and thus satisfy their need for competence (Deci & Ryan, 2004).Finally, to satisfy students' need for relatedness, there should be a co-construction classroom community in which everyone respect eachother. Classroom activities should connect students to their own community. For instance, students may learn about environmental resources such as activist groups, environmental organizations and model environmentalists who share similar backgrounds with students. Guest speakers explaining their environmental studies may be invited in the courses. Such activities may support students' need for relatedness in EE classrooms (Darner, 2007). Moreover, studying in a group allow students to collect different ideas and make a decision. They learn

about different perspectives and comments in the group (Darner, 2007). Furthermore, social climate influences self determined motivation. Involvement, information, autonomy support are positive dimensions of social climate and have a positive effect on self determined motivation.Briefly, other people's concern about the environment in the same community affect people's motivation for pro-environmental behaviors (Pelletier, 2004, p. 226).

In conclusion, using SDT in EE classrooms is one of the new ways to support pro-environmental behaviors. Therefore, it is essential to examine the instructional and cognitive features fostering self-determination for pro-environmental behaviors in the classrooms.

CHAPTER 3

METHOD

In this chapter, the method of the present study is presented in detail: First, the general design of the study is described. Then, setting and case descriptions of the study, participants, and data collection procedures and data analysis are given. Finally, trustworthiness of the study, assumptions and limitations of the study are presented.

3.1. General Design and Rationale:

The purpose of this study is to examine pre-service science teachers' motivation toward environment and to understand how their basic psychological needs were supported during the course activities. This study is a mixed method design that includes both qualitative and quantitative data collection procedures. In the quantitative part of the study, survey research was used and in the qualitative part, multiple case study design was utilized. The main investigation depended on survey study and case study was used to get a deep understanding about the survey; therefore, this study design also represents a case study within a survey (Yin, 2009, p.63).

Qualitative case studies have a variety of definitions. Merriam (2009) reported that qualitative case study is an inductive and mainly descriptive strategy including its boundaries or limits. Creswell (2007) pointed out that case studies may include a bounded system (case) or multiple bounded systems (cases). Furthermore, qualitative case study is defined by Yin (2009) as "*an empirical inquiry that investigates a contemporary phenomenon in depth and within its real life context, especially when the boundaries between phenomenon and context are not clearly evident*"

(p.18)Through case study design, researchers understand the process in-depth (Merriam, 1998). Merriam (1998) also reported that concepts, models, theory and educational psychology are the determinants of boundaries in case study. Case studies which embrace important contextual conditions allow researchers to understand a real life phenomenon deeply (Yin, 2009, p. 18). A case may be defined "*an object not a process*" (Stake, 1995); a "*group, intervention, community or specific policy*" (Merriam, 1998); "*an event or an entity*" (Yin, 2009); and "*a person, persons or program*" (Merriam, Stake & Yin). Since the aim of this qualitative case study is to compare each course week (six weeks) to understand how PSTs' basic psychological needs were supported, each week including difference topics, discussions and assignments was considered as a case.

Multiple case studies include more than one single case and they contain much more resources and time (Yin, 2009). Multiple case studies may be holistic or embedded (Yin, 2009, p. 53). In multiple holistic case designs, in order to answer the same research question, data is collected separately from the cases and then, the findings obtaining from these cases are compared (Yin, 2003). In other words, multiple case studies include a replication logic that leads researchers to seek similar results for each cases (a literal replication) or contrasting results (a theoretical replication) (Yin, 2009, p. 54). In consequence, each of the multiple cases should be similar such as two teachers or organizations etc. and also the data analysis and data collection procedures should be the same to compare or integrate the findings (Yıldırım & Şimşek, 2000).

In the present study, how PSTs' basic psychological needs were supported was examined through the course weeks and these course weeks including environmental problem solving activities were compared. Through the six course weeks which include environmental activities of the course, qualitative data were collected from multiple sources. A focus group was selected to investigate how PSTs' basic psychological needs were supported. The data were collected from group discussions, semi-structured interviews and weekly evaluation of assignments.

Interviews were conducted with the focus group participants after each week and these interviews continued a total of six weeks. To triangulate interviewfindings, audio recordings of group discussions and assignments given through the six weeks were examined. Besides, PSTs prepared a final project in which they proposed their personal solutions about an environmental problem and wrote reflections about their project. These reflection papers were also utilized to triangulate data.On account of this multiple case study, consistent patterns or changes were explored from different cases (weeks). Owing to the replication logic in multiple case studies, it was expected to find similar results from each separate cases. As a consequence, the present study is not an experimental study, yet it may be a step to conduct experiments in the future and to explain how a treatment worked or not (Yin, 2009).

For the quantitative part of the present study, surveys were administered before, after and five months later following the course to examine PSTs' motivation toward environment. Moreover, during the discussions, surveys were used to measure PSTs' basic psychological needs (competence, autonomy and relatedness). The general design of the study was presented in figure 3.1.

A case study within a survey

Survey of the whole class

↓

Case study of five PSTs (focus group)
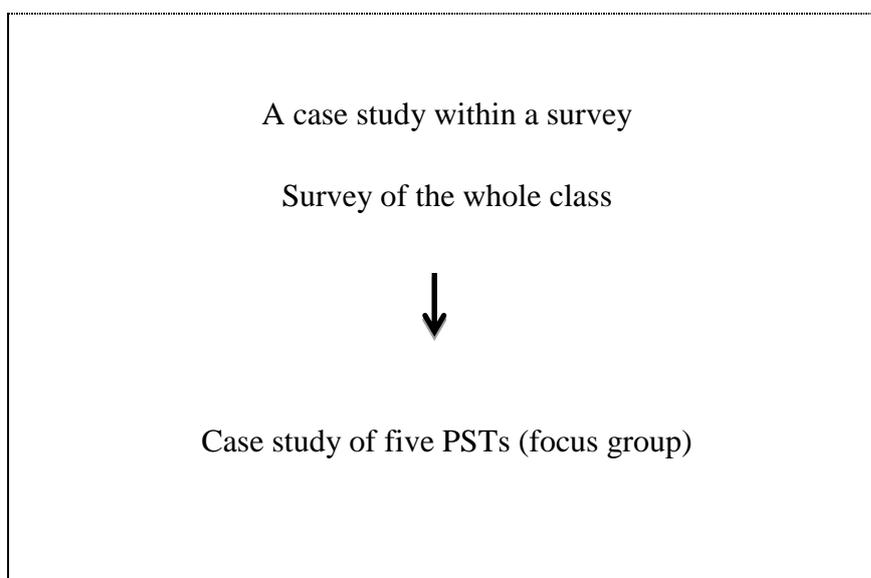
Figure 3.1 The general design of the study.

Source: Yin, 2009

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3.2 Setting and Case Descriptions:

This study was conducted in an environmental science course that was given pre-service science teachers in fall semester 2009-2010. The course which lasted 13 weeks was a must course of PSTs and included only one section. Moreover, in 6 weeks of the course, environmental activities were carried out. The course catalog states that the aim of the course is to "*help students develop a concern for the environment and sustainable use of natural resources in line with the following concepts: the history of the environmental science and environmental problems; people, population and environment, global and local environmental problems; sources of pollution, air, water, soil, radioactive pollution problems, loss of biological diversity and also its aim is to help students gain an insight about the individual and public responsibilities in line with introducing activities of non-governmental organizations, case studies and environmental education practices*" (Metu, Register Office, 2007-2009, p.419). In the light of the course catalog and course syllabus, the activities of the six course weeks were prepared. These course weeks cover the environmental problems, related assignments and a final project in which PSTs proposed their personal solutions to the problems. All these activities were prepared by the researcher and checked by three experts in science education.

PSTs were separated into the groups at the beginning of the semester and they worked with the same group during the whole semester. Each group discussed environmental problems and found out solutions to the problems. After each course week, they prepared their assignments individually about the subjects they selected. Lastly, the same group prepared their project about an environmental problem which they chose. Moreover, they wrote a reflection paper about their projects. In the first place, environmental problem solving will be described briefly and then, each course week that represents a case will be explained in detail.

3.2.1 Environmental Problem Solving

Environmental problems are connected to human interactions with the environment. It requires physical and biological understanding and includes economic and collaborative interactions (Benda, Poff, Tague, Palmer, Pizzito, Cooper, Stanley & Moglen, 2002). Many of these problems occur because of human behavior (Darner, 2007). Environmental problem solving in the classroom gives opportunity to students for considering and investigating environmental solutions in a challenging situation and thus satisfies their need for competence (Deci & Ryan, 2004). Moreover, when they were offered choices during the activities, their need for autonomy was satisfied (Ryan, 1995).

In this study, real environmental problems were used. Some of them have already occurred problems but, they left a great effect on environment and some of them has still remained as a problem. Some of the problems were chosen from Turkey representing local environmental problems and some of them were non-local environmental problems. Using real environmental problems in EE courses foster pre-service teachers' responsibility and awareness toward environment; therefore, they are crucial in EE (Tuncer & Erdoğan, 2006). Moreover, real life problems support students' need for competence and allow them to betterunderstand that they are a part of the solution (Darner, 2007). The questions in each problem started asking the reasons of the problem and PSTs discussed possible reasons of the problem. Then, other questions were about how this problems may be solved. I mean that the subsequent questions were related to the possible solutions of the problem.

3.2.2. Six Case Course Weeks

In this part, six cases which represent each course week including environmental problems, group discussions and assignments and their descriptions are presented in turn.

CASE 1

The subject covered in this course week was ecology and environmentalism and history of environmental science. PSTs were given two environmental problems in this course week. One of them is the story of Easter Island which was happened years ago and the other one is a general problem as Environment vs. Economy.

- **The story of Easter Island:**

This problem is about excessive resource usage in an island located in the Pacific Ocean and its consequences for the islanders. The purpose of this problem is to introduce PSTs with an environmental disaster occurred in the past and to help them understand the relationship between this event and today's world. Three questions following the problem were asked to the PSTs. The first question was about whether this story was the unique or holds a lesson for today. The second question was about whether they can see similarities between the history of Easter Island and modern history of the world. The last question was about whether the world will encounter the same situation or not if people continue consuming resources like today. These questions promoted PSTs to think about today's' problems and compare them with the Easter Island case. PSTs maintained their discussions around these questions and they presented their comments and ideas related to these questions. Thus, PSTs learnt about the destruction and its damages to the island. Hence, they took lesson from the history of Easter Island and they started to think about conserving resources more willingly. Thus, this problem (Easter Island) promoted PSTs to consider how lessons can be learned without making the same mistakes again. The problem and relevant questions are given in Appendix A.

- **Environment vs. Economy:**

This problem was given to PSTs immediately after the Easter Island problem. The purpose of this problem is to develop an understanding about the relationship between economy and environment. After the Easter Island issue, they focused on today' situation and they discussed the pressure of economy on the environment and considered whether environment may dominate the economy or not. Moreover, they were asked what economical and environmental concerns may be present today. It is expected that they touch on the issues as sustainable development, sustainable economy and sustainable life. Moreover, after these two critical problems, PSTs discussed how people can live in a harmony without destroying the nature and how sustainable life may be achieved. This problem and relevant questions are given in Appendix A.

At the end of this course week, PSTs were given an assignment and they chose their problem and prepared it through the week. This assignment helps PSTs feel part of the problem and fosters their motivation toward environment. Each participants prepared their assignment for following week. The assignment given to PSTs was explained below.

Assignment 1: I would like you to find a case that led to an environmental degradation in the past like Easter Island. This case can be from your town, city or any country you know. Analyze it critically. Write problems and threats to the environment related to this case and your suggestions for solving the problem if it is still going on.

CASE 2

In this course week, the topic that was changing attitudes to the natural world was instructed. In the light of this issue, an environmental problem which still causes a

dilemma on people was discussed in the course. The problem was namely Paper vs. Plastic.

- **Paper versus Plastic:**

The purpose of this problem is to ask PSTs to put themselves in routine situations and think about their everyday decisions. They make explanations about their everyday decisions that are more or less sustainable and offer convincing explanations why these behaviors are environmentally friendly or not. In the problem, they discussed which one is more environmentally friendly, paper or plastic or none of them. Three questions were asked to PSTs following the problem. The first question was that which one they choose in a grocery, paper or plastic and they were required explain their answer. The second question was about which one should be used more, paper or plastic. With these questions, the advantages and disadvantages of using plastic and paper were discussed and PSTs compared each material. The last question was a more general and effective one. They were asked why people don't show pro-environmental behaviors even they have positive attitudes toward environment. Their ideas, suggestions and solutions were taken with regard to these questions. The problem and relevant questions were given in Appendix A.

Moreover, in this week, a guest speaker from Nature Society (a non-governmental organization) came to class and explained how to prepare environmental action plans (EAP). He showed sample action plans in the class. Indeed, PST did not prepare a real environmental action plan yet, they proposed their personal solutions to an environmental problem which they determined in their community. Therefore, learning about how to prepare environmental action plans helped them prepare their project.

The assignment given in this week was about how they can encourage people to change their attitudes and behaviors toward environment. Each group prepared a

video or a presentation about the environmental issues which they selected. This assignment promoted them to act for the environment.

Assignment 2: How can people change their attitudes and their behaviors to the environment? I would like you to be prepared to encourage people to change their attitudes and behaviors to the environment. You can choose any environmental issue like energy, water, wastes, etc. You will prepare a 10-15 minute persuasive video with your group.

CASE 3

In this course week, conservation values and ethics, the value of biodiversity and conservation ethic issues were explained. Extinction of species problem was given to PSTs as an environmental problem.

- **Why worry about Extinction?**

In this problem, firstly, PSTs learnt about endangered and extinct species in Turkey and then they considered what may be the reasons of this extinction. They also discussed what they can do to reduce the rate of extinction. Four questions related to problem were asked to PSTs. Firstly, they were asked what may be the reasons of the extinction of species. Secondly, they were asked why it is important to save these species and what the value of biodiversity is. They got an understanding about the importance of each species in the world. The third question was about what they could do to save these species. The last question was about environmental programs and organizations. They argued about these organizations and their works. Actually, this problem aims that PSTs develop an understanding that human is the reason of this problem and also is the solver of it. If they can make this connection between human and problem, their basic psychological needs may be supported. They may feel more competent.

Following this course week, PSTs investigated biodiversity loss problem in their country or any place from the world as an assignment and they selected their own case and examined the reasons and results of the problem. The assignment was presented below.

Assignment 3:I would like you to search for a case about biodiversity loss. This case can be from any source (internet, journal, newspaper) or it can be from your local environment. Then, I would like you to analyze this case critically from both an ecological and social perspective.

CASE 4

The topic of this course week was air pollution so; ozone depletion issue was discussed in this week. Moreover, daily need satisfaction instrument was conducted after the discussions finished in this week.

- **Reducing Ozone Depletion:**

By virtue of some protocols and agreements, CFCs emissions declined in the stratosphere. However, CFCs has a long residence time in the stratosphere; therefore, ozone depletion because of CFCs will continue for many years (Keller & Botkin, 2008, p.306). The purpose of this problem was to introduce PSTs a success story. The case was not actually a problem. Nevertheless, ozone depletion is still one of the environmental problems today. PSTs learnt about harmful effects on ozone depletion may be removed with an agreement. Through the questions in the problem, they discussed the effects of ozone depletion to the environment. Moreover, they talked about the solutions of the problem. Also, they were asked if it is possible to change people's habits and what this story indicates. This kind of success stories may support their relatedness and they feel more connected to the environment.In this course week, PSTs were not given an assignment. After the discussions finished,

daily need satisfaction instrument were administered to them to measure whether their basic psychological needs were supported or not in this week.

CASE 5

The topic of this course week was water pollution and PSTs discussed about the effects of dams in terms of Hasankeyf which were located in Batman, Turkey. Moreover, daily need satisfaction instrument was conducted after the discussions finished.

- **Ilısu Dam Project- Hasankeyf:**

The purpose of this problem was to develop PSTs' understanding about dams that have been always a controversial issue. Five questions were asked to them following the problem. Before they started to argue about the problem, I showed them news from media about Hasankeyf and some photos of species living there. After this small presentation, they began to talk about the problem in their group. Firstly, they argued about the effects of dams to the environment, culture, history and society. They talked about what may happen after the dams were constructed. Furthermore, they were asked what they could do to protect Hasankeyf and also, they were asked which one is more important to produce energy in Hasankeyf or history and environment of there. In brief, they learnt about ecological, social and economic effects of dams. Moreover, while PSTs tried to find out solutions and they thought about consumption of energy and water and also alternative energy resources. The problem and relevant questions are given in Appendix A.

Assignment 4: In this course week, PSTs were presented four options related to water pollution and they were asked to select one of them and make a research about it. The assignment subjects are like that:

- Please investigate how excessive detergent usage affect environment and explain your solutions to decrease detergent consumption? What can you do to make people aware about harmful effects of detergent consumption? What can you offer instead of detergent consumption as an alternative?

- Make a research about a wetland (lake, river, etc). Investigate the biodiversity of this wetland and explore the threats in the wetland. Investigate if there is water pollution and the reasons of this pollution in the wetland. Lastly, offer solutions to protect this wetland.

- Investigate water consumption and water trouble of some developed and developing countries. You can compare several countries in terms of water consumption and suggest solutions about how people can use water in a more sustainable way.

- Investigate from your community/city: Where does water come from and how is it treated? Do you think water supplies are adequate in your community? What actions should we consider to meet future needs?

CASE 6

Soil pollution was the topic that was covered in this week. Therefore, PSTs discussed about a solid waste problem in terms of Mamak garbage dump located in Ankara, Turkey example.

- **Ankara Mamak Garbage Dump**

This was the last problem given to PSTs. In this course week, they discussed solid waste problem in Mamak Garbage Dump. They discussed about the effects of dump to the environment. Moreover, they considered the solutions of the solid waste problem and they tried to answer the question asking whether zero waste is possible or not. Besides, daily need satisfaction instrument was conducted after discussions finished. The problem and relevant questions were given in Appendix A.

As an assignment, PSTs investigated solid waste management in their hometown. In this way, they became aware of local problems in their community.

Assignment 5:I would like you to make a research about solid waste management issue in your hometown. I want you to search about following issues:

- How much waste does your city produce in a day or in a year? You may give statistical data.
- How does municipality deal with solid wastes in your city? In other words, where are the wastes collected and how does municipality handle with them?
- What about package wastes like plastic, paper? Is there any collection - separation and recycling facility in your city? If not, what can be done to disseminate these facilities in your city?
- Lastly, how can you reduce the wastes you generate each day? What kind of solutions do you have?

Through the each course week, firstly, I read the problem and allowed the PSTs to ask their questions related to the problem. After that, they turned back to their groups and read the problem again and discussed. Group discussions lasted about 20 minutes and later, they shared their suggestions, ideas, and solutions with the other groups. Each group shared their ideas about the problem One person from each group explained what they considered and suggested to solve the problem. Then, they discussed the controversial issues in the problem together. This process continued in other weeks, as well. Moreover, the focus group discussions were tape recorded through the six weeks. When the six course weeks finished, PSTs were given extra time to prepare their final project. The description of their final project was presented below.

3.2.3 Final Project

This project included specific environmental problems which PSTs chose in their community. For this project, PSTs are required to determine an environmental problem which is close to their real life, introduce the problem and the area where the problem occurred and produce personal solutions to the problem. The content of this project was originated from preparing environmental actions plans. In these kinds of projects, a voluntary group such as students, teachers, and members of NGO (Non-governmental organization) may choose an important nature area to protect it. Firstly, they give ecological, social and cultural information about the area. They describe the area in detail. Then, they determine the institution where they will work together. This institution may be a school, a university, a municipality or a community. After they determine the time interval when they will work together, they explain the specific problem and the reasons of the problem. They investigate what may be the reasons of the problem and then, they declare their solutions or actions related to each reason of the problem. In this course, PSTs firstly introduced the environmental problem which they chose before and then, they explained possible reasons of the problem and lastly, they presented their actions or solutions for the problem.

Each group prepared their projects about the problems which are respectively "*Waste Problem in the METU (Middle East Technical University), Food Problem in METU, Pollution in Mogan Lake in Ankara, Energy Consumption in METU, Water Consumption in METU and Waste Problem in Eymir Lake* in Ankara. The issue which Focus group members studied was "*Food Problem METU*". They specifically examined the food consumption in Metu. They investigated whether organic food is consumed or not in the university. After preparing their final project, each of the participants presented their solutions or actions with regard the problem in the class and later, they wrote a reflection paper about their final project.

3.3 Participants:

A total of 33 volunteer pre-service elementary science (22 females and 11 males) attending a large public university in Ankara participated in the study. All participants were taking anenvironmental science course offered by the Department of Elementary Education. 32 of them were undergraduate students who were in their senior year of elementary science education program and 1 of them was a graduate student at the department.The age range of participants was from 21 to 28 with an average 23 years. While majority (57.6%) of the participants lived in a big city before enrolling in the university, about 6 % of the participants lived in rural area and 9.1% of them lived in a small town and. The educational level of participants' mother was primary (9.4%), secondary (18.2%), high school (18.2%) and university (18.2%) and the educational level of participants' father was primary (18.2%), secondary (25.3%), high school (27.3%), vocational high school (6.1%), and university (30.3%). Over three-quarter of participants (75.8%) perceived their parents' concern about environmental problems as enough, while 15.2% of them perceived it as little. About 6 % of the participant perceived that their parents do not show any concern about environmental problems. Regarding, perceived parents' pro-environmental behaviors, majority of the participants (66.7%) perceived that their parents are little active about pro-environmental behaviors, while just 3% of them perceived their parents as very much active. On the other hand, over one-quarter (27.3%) of participants had a perception that their parents are not active about pro-environmental behaviors.

Among the six groupsthat were formed at the beginning of the semester, one focus group was selected. One person from each group accepted to be in focus group voluntarily and thus, five PSTs placed in the group. All five participants were female and followed the courses regularly. They attended in each course week (case) when the activities were conducted. This study was performed in an environmental science course because of its purpose. The cases constituted each six course weeks since these weeks were the ones that activities and discussions were carried out. Therefore,

purposeful and convenient sampling method was utilized because the course was instructed in the same department where the researcher works.

3.4 Data Collection Instruments:

In this study, to collect quantitative data, Motivation toward Environment Scale (MTES) developed by Pelletier et al. (1998), Amotivation toward Environment Scale (AMTES) developed by Pelletier et al. (1999), Learning Climate Questionnaire (LCQ) developed by Black and Deci (2000) and connectedness subscale of the Classroom Community Scale(CCS) developed by Rovai (2001) were used. LCQ and CCS were combined and used together as a 16 item scale. As a last questionnaire, Daily Need Satisfaction Scale (DNSS) developed by Laguardia, Ryan, Couchman and Deci (2000) was utilized. To collect qualitative data, interview questions prepared by Darner (2007) were used. Moreover, activity sheets (environmental problems), assignments and reflection questions were prepared by the researcher based on the SDT theory. Environmental problems were selected from various sources and prepared for the course. At the end of the course, evaluation questions were given to evaluate the activity part of the course.

3.4.1. Motivation toward Environment Scale (MTES):

In order to assess PSTs' motivation toward environment, MTES was used before, after and five months later following the course. MTES which measure individuals' motivation toward pro-environmental behaviors included 22 items and 6 subscales. Items in the scale were randomly placed and they represented the possible answers to the question that is "Why are you doing things for the environment?" The subscales in the MTES refer to the motivation types determined by SDT; intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation and amotivation. The scale was a 7 point likert scale ranging from 1 (doesn't correspond at all) to 4 (corresponds moderately) and 7 (corresponds exactly).

The MTES was validated by Pelletier et al. (1998). Afterwards, the validation of the scale was repeated by Villacorta, Koestner and Lekes (2003). At first, the scale consisted of 60 items in which ten items represent each subscale. In order to reduce the number of items, exploratory factor analysis was conducted. Thus, 24 item scale included four items per subscale was generated (Pelletier, et al., 1998). Secondly, confirmatory factor analysis for 24 item scale was conducted to measure the correlation between subscales and reliability of subscales. After that the relationship between MTES and environmental and psychological constructs (self-esteem, environmental attitude, perceived competence etc.) was assessed (Pelletier, et al., 1998). Thus, validity of the scale was provided. Villacorta et al. (2003) also further validated the MTES and the results of the study confirmed the discriminant and convergent validity of the scale. Moreover, the reliability of MTES subscales ranged from .78 to .96. As has been noted, MTES was a good reliable and valid instrument to measure motivation toward environment.

In the present study, before conducting MTES in the classroom, it was translated into Turkish and pilot tested. In the translation process, the scale was examined by 4 researcher assistants and 3 expert science educators. To provide validation and reliability of the scale, it was administered to 134 pre-service science teachers. For pilot testing, the scale included 27 items. After exploratory factor analysis, 4 items that didn't work were eliminated and to validate 6 factor structure with 22 items confirmatory factor analysis (CFA) was conducted. According to CFA results, intrinsic motivation, integrated regulation, identified regulation and amotivation subscale included four items while external motivation and introjected regulation included 3 items. CFA and Croanbach's alpha results are presented in table 3.1. Also, the sample items for each subscale were given in table 3.2

Table 3.1 MTES subscales' CFA and Croanbach Alpha Results

MTES Subscales	Croanbach Alpha	Good Fit Index (GFI)	Comparative Fit Index (CFI)	Standardized RMR
Intrinsic Motivation	.90	0.94	0.96	0.027
Integrated Regulation	.87	0.99	0.99	0.0139
Identified Regulation	.85	0.93	0.94	0.0391
Introjected Regulation	.76	perfect	perfect	perfect
External Motivation	.79	0.98	0.98	0.0362
Amotivation	.70	0.96	0.94	0.0557

Table 3.2 MTES subscales and sample items

MTES subscales	Sample Items
Intrinsic motivation	For the pleasure I experience while I am mastering new ways of helping the environment
Integrated regulation	Because being environmentally conscious has become a fundamental part of who I am
Identified regulation	Because it is a reasonable thing to do help the environment
Introjected regulation	I think I would regret not doing something for the environment
External regulation	For the recognition I get from others
Amotivation	Honestly, I do not know; I truly have the impression that I am wasting my time doing things for the environment

3.4.2 Amotivation toward Environment Scale (AMTES)

AMTES developed by Pelletier et al. (1999) was used to measure why PSTSs are amotivated toward pro-environmental behaviors. The scale that was administered together with MTES before, after and five months following the course included 16 items and four subscales. Each subscale includes four items, namely strategy beliefs, effort beliefs, capacity beliefs, helplessness beliefs. These subscales demonstrated the reasons of individuals' amotivation toward environment like amotivation because of negative strategy beliefs (Pelletier, et al., 1999). Confirmatory factor analysis confirmed that the scale had a strong validity. Furthermore, CFA and correlations between four subscales of the AMTES and the relationship among other environmental constructs (e.g. perceived competence for the environment, perceived importance of the environment, perceptions of autonomy support) supported validity of the scale (Pelletier, et al., 1999). Also, internal consistency of AMTES subscales ranged from .79 to .88.

Before, the scale was utilized in the course, it was translated into Turkish and pilot tested.In the translation process, the scale was examined by 4 researcher assistants and 3 expert science educators.During its validation for Turkish sample, the AMTES was administered to 67 pre-service science teachers. In order to explore the factor structure of the scale, exploratory factor analysis was conducted and it was determined that four items were fitted for per subscale like in the original scale. Croanbach's alpha coefficient was calculated as measures of reliability and showed a good reliability as .89. Items and factor structure of the AMTES were given in table 3.3 and also, the croanbach alpha results of AMTES subscales for the pilot study and sample items were given in table 3.4.

Table 3.3 Items and factor structure of the AMTES

Item number	Component1	Component 2	Component 3	Component 4
Amtes 1	.78			
Amtes 2	.60			
Amtes 3	.82			
Amtes 4	.62			
Amtes 5		.84		
Amtes 6		.86		
Amtes 7		.78		
Amtes 8		.79		
Amtes 9				.80
Amtes 10				.61
Amtes 11				.79
Amtes 12				.51
Amtes 13			.86	
Amtes 14			.74	
Amtes 15			.83	
Amtes 16			.80	

*Total % of Variance of four component: 73.47 %

Table 3.4   AMTES subscales and sample items

AMTES subscales	Croanbach's Alpha	Sample Items
Strategy beliefs	.77	I don't think that present programs are really going to help the environmental situation
Effort beliefs	.88	I can't seem to try hard enough
Capacity beliefs	.85	I don't feel that I have the competence to do these things for the environment.
Helplessness beliefs	.89	What little I could do for the environment wouldn't have any impact on a larger scale

After the pilot study, AMTES was administered in the course. The scale which was a 7 point likert scale ranging from 1 (doesn't correspond at all) and 7 (corresponds exactly) included the items as responses to the question that is "Why are not doing things for the environment?" The pre-post and follow up measurement of AMTES subscales' croanbach alpha results are presented in table 3.7.

3.4.3 Learning Climate Questionnaire (LCQ) and Classroom Connectedness Scale (CCS)

LCQ developed by Black and Deci (2000) was used to measure whether PSTs' needs for autonomy was supported or not. The scale consisted of 6 items in one dimension namely, need for autonomy. In addition to LCQ, CCS developed by Rovai (2001) was used to assess whether PSTs' need for relatedness was supported or not. This scale included 10 items in one dimension. Both scales were on a 7 point likert scale ranging from 1 (strongly disagree) and 7 (strongly agree) and included a total of 16 items. LCQ and CCS scales were used in English. Sample items for LCQ and CCS are demonstrated in table 3.3. Moreover, the reliability of two connected scale was presented in table 3.5.

Table 3.5 Sample items of LCQ and CCS

Scales	Sample Items
LCQ(Autonomy support)	I feel that my instructor provides me choices and options My instructor listens to how I would like to do things My instructor encourages me to ask questions
CCS(Relatedness support)	I feel connected to others in this course I feel that this course is like a family I feel isolated in this course

3.4.4 Daily Need Satisfaction Scale

In the last three weeks of the course activities, daily need satisfaction survey (DNSS) was administered to measure PSTs' basic psychological needs. The scale is a version of general need satisfaction survey developed by Laguardia, et al. (2000) and modified for the classroom community by Darner (2007). The scale which was a 7 point likert scale ranging 1 (not at all true) and 7 (very true) consisted of 9 items in three dimension namely, autonomy, competence and relatedness subscales.The scale

which was used to support the qualitative data was not adapted to Turkish. Sample items for DNSS are presented in table 3.4

Table 3.6 DNSS subscales and sample items

DNSS Scale	Sample Items
Autonomy	While participating in class today, I felt controlled and pressured to be a certain way
Competence	While participating in class today, I felt like a competent person
Relatedness	While participating in class today, I felt care about

Croanbach alpha coefficients of the scales which were conducted before, after and five months later following the course activities were presented in table 3.6. The croanbach alpha results of these scale revealed that sub-scale reliabilities were high enough to conduct further analyses. However, it is important to note that the reliability coefficients for pre-external regulation and follow-up external regulation were somewhat low but acceptable for educational studies (Diakidoy, Kendeou, & Ioannides, 2003; Pinarbasi, Canpolat, Bayrakceken, & Geban 2006).

Table 3.7 Croanbach's alpha coefficients for each scale

Measures	Croanbach's Alpha
Pre MTES	.79
Post MTES	.79
Follow MTES	.76
Pre AMTES	.90
Post AMTES	.89
Follow AMTES	.89
Pre-intrinsic	.78
Post-intrinsic	.88
F-intrinsic	.88
Pre-integrated	.85
Post-integrated	.81
F-integrated	.86
Pre-identified	.89
Post-identified	.83
F-identified	.84
Pre-introjected	.70
Post-introjected	.65
F-introjected	.68
Pre-external	.55
Post-external	.73
F-external	.42

Table 3.7 continued

Measures	Croanbach's Alpha
Pre-amotivation	.76
Post-amotivation	.89
F-amotivation	.75
LCQ(16 item)	.92
DNSS 1	.65
DNSS 2	.66
DNSS 3	.78

*LCQ included autonomy and relatedness subscales, DNSS 1 is daily need satisfaction questionnaire administered in course week 4, DNSS 2 is daily need satisfaction questionnaire administered in course week 5 and DNSS 3 is daily need satisfaction questionnaire administered in course week 6.

All quantitative instruments used in this study are presented in Appendix B.

3.4.5 Interview protocol

In order to examine whether PSTs' basic psychological needs were supported or not, semi-structured interviews were conducted with the focus group members through the six weeks. Interview protocol was developed by Darner (2007) and translated into Turkish by the researcher. During the translation, 3 experts in science educationexamined the questions in the interview. The interview protocol which included 7 questions was conducted to five participants of focus group each week (a total of six weeks). The interview protocol was presented in Appendix C.

During the six weeks of the course, activity sheets including environmental problems and questions were given to participants and discussions of focus group members were audio taped. After each week, PSTs were given assignments related to problems. Moreover, whole systems rubric developed by Cloud (2005) as cited in Darner (2007) was used to measure PSTs' need for competence about their environmental action plan. Moreover, after PSTs prepared their project, they wrote a

reflection paper of which questions were developed by modifying interview questions.

3.5 Data Collection Procedure

Data werecollected to examine the environmental motivation of pre-service science teachers and determine how PSTs' basic psychological needs were supported during the environmental activities in the course. Before data collection procedure, ethical permission from Ethical Committee was taken in order to conduct the study with human subjects. The data were collected in fall semester (2009-2010) and lasted 3 months. In the summer semester just before the main study started, pilot study of two questionnaires (MTES and AMTES) was carried out and validity and reliability analyses were conducted. The main data was collected in an environmental science course which wasoffered to PSTs as a must course. The environmental problems, assignments and a final project were prepared with respect to the course syllabus. The content of the course was announced to the PSTs in the first week of the course and they learnt what they will do through the course. Moreover, at the beginning of the semester, PSTs were divided into groups through using of an environmental attitude questionnaire (EAQ) developed by Tuncer, Ertepınar, Tekkaya and Sungur (2005) to constitute heterogeneous groups who have different environmental attitudes toward environment. The groups of 5-6 people were constituted with regard to their response in the scale. One person from each group accepted to participate in the focus group voluntarily and thus, focus group of 5 people were formed. Furthermore, the permissions of all participants were taken for data collection in the course.

Before course activities started, MTES, and AMTES instruments were administered to the PSTs in order to get information about their environmental motivation and their background characteristics. During the six course weeks, PSTs were given environmental problems and wanted to discuss them with their group friends. This part of the each course lasted about 45 or 60 minutes. Previously, the researcher

announced and read the problem and questions to the PSTs loudly and answered the questions asked by PSTs. The questions in each problem included the reasons of the environmental problem and later, the solutions related to problem. Later, PSTs discussed the problem with their group friends and then, they shared their ideas, comments and solutions with the whole class. In other words, first in group discussion was performed and next the whole class discussion was done. After each group finished their discussion, the researcher wanted groups to share their ideas. During the discussions, researcher visited each group and guided them and also, answered the incoherent questions about the problem yet, she didn't give any direct answers to them. After whole class discussion finished, weekly assignments were declared to PSTs and wanted them to complete their assignments until the following course (one week later). Five assignments were given to PSTs during the six weeks of the course. Each assignment was related to course issues and generally represented an environmental problem. They were free to select their own case for the each assignment. Besides, assignments were connected to PSTs' real life and promoted them to feel a part of the solution.

Each of the five focus group members was interviewed after the each course week. In the first, third and sixth weeks of the course, five of the participants were interviewed. However, in the second and fifth week of the course, four of the participants engaged in the interviews and in the fourth week of the course, three participants were interviewed. Because the participants were not present in these weeks, they couldn't participate in the interviews. Each interview was conducted by the researcher and lasted approximately 15- 25 minutes. Each interview session was audio-taped after getting permissions of participants. Interviews were performed in a quiet and relaxed environment in order to prevent any interruptions.

At the beginning of the each interview, participants were asked to summarize what the problem was about and what they discussed and what they emphasized in the groups. In other words, firstly, they talked about what they tried to do with their group. They listened to audio recordings when they couldn't remember what they did

and said during the discussions. Moreover, the activity sheets were available during the interviews so that they could review the problem and questions. Later, they were asked questions in order to reveal whether their basic psychological needs were supported or not in the group.

After course activities finished, PSTs prepared their final project with their groups in which they studied through the whole weeks. Each group presented their project in the last two weeks of the course. At the end of the presentations, each person from the groups wrote a reflection paper with regard to their answers in the whole system rubric. Through these reflections papers, basic psychological needs of focus group participants were measured to support the data. Whole system rubric and reflection questions may be seen inAppendix D.

At the end of the course, MTES, AMTES and LCQ questionnaires were administered to PSTs to see whether any change occurred in their environmental motivation. Five months later following end of the course, MTES and AMTES were again conducted in order to understand whether PSTs' environmental motivation continued or not.

3.6 Data Analysis Procedure

After data collection procedure was finished, all interviews and audio-recordings were transcribed for each week. In order to analyze data both quantitative and qualitative data analysis methods were used.

For quantitative analysis, initially descriptive results were examined for MTES, AMTES and LCQ scale and their subscales. Moreover, for each subscales, croanbach alpha coefficients were calculated to provide internal consistency of the scales. Furthermore, one-way repeated measure ANOVA, Friedman test, canonical correlation analysis and Pearson moment correlation were carried out by using PASW statistics 18. To be more specific, for descriptive statistics, mean, standard deviation, kurtosis and skewness values were used to describe the sample and also,

the assumptions were checked for any violation. For inferential statistics, firstly, one way repeated measure ANOVA and Friedman test were used in order to examine PSTs' motivation toward environment across three times (before, after and five months later the course activities). Then, canonical correlation was used to investigate the relationship between self-determined motivation and basic psychological needs that were supported during the course activities. Lastly, Pearson moment correlation was utilized to investigate the relationship between autonomy, competence and relatedness that were supported during the course activities.

For qualitative analysis, open coding and constant comparative method suggested by Glaser and Strauss (1967) were used. In open coding procedure, the text is examined by the researcher for certain categories of information supported by the text (Creswell, 2007). Open coding starts with breaking down data into small units and the codes are created emergently. With regard to constant comparative procedure, the categories are saturated to find out more examples that represent the category (Creswell, 2007). In other words, regarding this analysis each incident in the data is compared with other incidents by discovering similarities and differences (Glaser & Strauss, 1967).

After I transcribed all the data (interviews and audio recordings) in verbatim, I read whole data and then, I started to analyze each week respectively. I analyzed the interviews for each participants, their discussions and assignments for the first week of the course and defined the categories. Some of the codes had already emerged inprevious studies, whereas some of them were emerged during the analysis. I grouped all the codes in different categories, which I determined before. These codes and categories and their descriptions were explored within the framework of the SDT theory and previous research. After I completed the first analysis, I started the second analysis. This process continued through the six weeks. At the end of the analysis, I compared the codes and categories emerged in these weeks. Some of the codes were not emerged in the first and second weeks. Some of them were emerged rarely, whereas some of them were emerged occasionally during the weeks. These codes

were explored based on the PSTs' comments on interviews, discussions and assignments. Furthermore, these codes and categories refer to evidences that seem to support or undermine PSTs' basic psychological needs. In other words, I tried to find out evidences from PSTs' comments regarding whether their basic psychological needs were supported or not during the course activities. I also observed the relationship among the codes from PSTs' comments and this indicated the relationship among basic psychological needs (competence, autonomy and relatedness) as well. This result was also supported by the quantitative data.

The summary of the research design of this study is presented in table 3.8.

3.7 Trustworthiness of the Study

In order to provide trustworthiness of the qualitative studies, validity and reliability issues should be considered (Merriam, 2009). For proving trustworthiness of this study, validity, reliability and ethical issues were taken into account.

3.7.1 Validation of the study

Various strategies to validate data were suggested by the researchers (Creswell, 2007). Creswell (2007) recommended that at least two of these strategies should be considered by the qualitative researchers.

One of them is prolonged engagement and persistent observation in the field offered by Creswell (2007). In the present study, the course activities lasted for six weeks, yet I engaged in the course through the whole semester since data collection continued. I observed the participants and knew them more closely. This provided me a prolonged observation and helped me be in a close relationship with the participants.

The other strategy which I used to validate data is the triangulation. In this study, methodological triangulation was used. Miles and Huberman (1994) stated that using different measurements allow researcher to make repeated verification. I employed different data collection methods that are interviews, audio recording, reflections and assignments. For methodological triangulation, interviews were triangulated with the audio recordings, assignments and reflections. Besides, some quantitative results were used to triangulate the qualitative data.

Eliminating the researcher bias is another issue taken into consideration for validation. Miles and Huberman (1994) suggested that researcher bias may occur in two ways. One is the effects of researcher on the case and the other is the effects of case on the researcher. Researchers who spend enough time on the site are less worried about the bias issues but, there may be the effect of case on researcher that is second biases. I collected my data from an ongoing course and I was a teaching assistant of this course. Students were in an ordinary class environment and they were aware of the aim of this study. While participants were hesitated to be audio recorded at the beginning of the course, they were get used to it and they did not care about the recording at the progressive period. During the discussions, I guided them and clarified some issues about the problems yet, I didn't influence them during the discussions. As a researcher of this study, I had some experiences about environmental issues. That is; being interested in nature observation like bird watching, being a member of some non-governmental organizations and being in some projects about environmental issues and environmental education.

3.7.2 Reliability of the Study

There are several ways to provide reliability (dependability) (Creswell, 2007). One of them is to get a good quality of tape recording and transcribing the tape. The other one is intercoder agreement (Creswell, 2007, p. 210). Both of the ways to improve reliability was achieved in this study. I used a good quality tape recorder for both discussions and interviews and transcribed them in verbatim. The second issue as

intercoder agreement refers to multiple coders to analyze data and this provides the stability of the responses (Creswell, 2007, p. 210). For the present study, two science education researchers examined the interview transcripts and 87% inter coder agreement was established between the researcher and science education researchers. Moreover, as the study was a case study, it is important to prepare a case study protocol to increase reliability (Yin, 2009). However, I didn't use any case study protocol, yet I tried to make clear all the processes, procedures and steps of the qualitative part of this study for further studies.

3.7.3 Ethics

In order to conduct this research, I got the permission from ethics committee in my university. There was not any harm and risk during the research. PSTs were aware of the aim of the study and they accepted to participate in this study voluntarily. At the every stage of the data, the researcher was honest with the participants. Moreover, the participants' privacy was preserved and their real names were not used for the anonymity while presenting the results. Furthermore, to provide confidentiality, there will not be any access to data findings by anyone except researcher and her thesis supervisor and co-supervisor.

3.8 Assumptions of the Study

The following assumptions were made by the researcher for this study:

- The qualitative data were collected during the six weeks. Five focus groups participants were interviewed in the each week of the course and this provided me a detailed and reliable data.
- The sample of this study was selected purposefully as they were the students who were taking the environmental science course. It was assumed that they were the good representatives in terms of understanding and suggesting solutions about environmental problems.

- The administration of instruments were done in standard conditions
- There was not any interaction among participants while conducting instruments.

3.9 Limitations of the Study

There are some limitations related to both qualitative and quantitative part of this study which is presented below:

- For the quantitative part of the study, the number of participants was limited to 33 participants who were taking environmental science course in fall semester 2009-2010. Hence, more research on this topic with a larger sample size is needed.

- The qualitative data were limited to the comments of participants, discussions, assignments and environmental problems given in the course. In order to understand whether students' basic psychological needs were supported or not, different environmental problems and different assignments which are close to students' real life may be found.

- Because of my first attempt to conduct case study, it was a very challenging process for me. However, to facilitate this process, I consulted two science educators who were the expert in this issue and I applied to reference books to understand the case studies better.

- The results of this study were limited to the contexts and design of the study; therefore, it may not be generalized to different contexts and another cases.

Table 3.8   The summary of research design of the study

	Environmental Problems	Instruments	Data Analysis
Pilot Study		Motivation toward environment and Amotivation toward environment scales	Exploratory and Confirmatory Factor Analysis
Before the course weeks	-	Motivation toward environment and Amotivation toward environment scales	One way repeated measure Anova & Friedman test
Course Week 1	The Story of Easter Island & Environment vs. Economy	1. Interview with focus group members 2. Discussion Recordings of focus group members 3. Assignments	Constant Comparative Method and Open Coding (Glaser & Strauss, 1967)
Course Week 2	Paper vs. Plastic	1. Interview with focus group members 2. Discussion Recordings of focus group members 3. Assignments	Constant Comparative Method and Open Coding (Glaser & Strauss, 1967)
Course Week 3	Why Worry about Extinction?	1. Interview with focus group members 2. Discussion Recordings of focus group members 3. Assignments	Constant Comparative Method and Open Coding (Glaser & Strauss, 1967)

Table 3.8 continued

	Environmental Problems	Instruments	Data Analysis
Course Week 4	Reducing Ozone Depletion	1. Interview with focus group members 2. Discussion Recordings of focus group members 3. Assignments 4. Daily Need Satisfaction (DNSS)	Constant Comparative Method and Open Coding (Glaser & Strauss, 1967)
Course Week 5	Ilısu Dam Project (Hasankeyf)	1. Interview with focus group members 2. Discussion Recordings of focus group members 3. Assignments 4. Daily Need Satisfaction (DNSS)	Constant Comparative Method and Open Coding (Glaser & Strauss, 1967)
Course Week 6	Mamak Garbage Dump	1. Interview with focus group members 2 Discussion Recordings of focus group members 4. Assignments 5. Daily Need Satisfaction (DNSS)	Constant Comparative Method and Open Coding (Glaser & Strauss, 1967)
After the course weeks	-	Motivation toward environment , Amotivation toward environment scales and Learning Climate Questionnaire	One way repeated measure Anova & Friedman test
Follow up measurement (Five months later following the course)	-	Motivation toward environment and Amotivation toward environment scales	One way repeated measure Anova & Friedman test
The last two weeks of the course	Preparing the final project	Whole system rubric and reflections	

CHAPTER 4

RESULTS

In this chapter, quantitative and qualitative results of the study are presented. The first part includes quantitative results of the study and the second part includes qualitative results of the study.

4.1 Quantitative Results:

4.1.1 Descriptive Statistics

Descriptive results for the students' pre, post and follow up motivation toward environment and amotivation toward environment i.e., intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation, amotivation, strategy beliefs, capacity beliefs, effort belief, helplessness measured by MTES, AMTES and also autonomy and relatedness scales measured by LCQ-CCS and basic psychological needs scales measured by DNSS respectively were presented in the Table 4.1, 4.2, 4.3 and 4.4. MTES and AMTES scales were 7 point likert scale ranging from 1 (does not correspond) to 7 (corresponds exactly). The descriptive results of MTES subscales before, after and five months following the courseare presented in table 4.1.

Table 4.1 Descriptive Statistics related to subscales of MTES

	M	SD	Min	Max	Skewness	Kurtosis
Pre-intrinsic	5.43	.72	4.25	7	.272	-.455
Post-intrinsic	5.66	.94	2.75	7	-.780	1.420
F-intrinsic	5.57	1.06	2	7	-1.284	2.786
Pre-integrated	5.22	1.07	2.50	7	-.685	.348
Post-integrated	5.31	1.02	2.75	7	-.584	.107
F-integrated	5.31	1.21	2.25	7	-.673	.187
Pre-introjected	5.63	.96	3.00	7	-1.004	1.156
Post-introjected	5.27	1.05	3.67	7	.114	-1.317
F-introjected	5.21	1.27	2.67	7	-.518	-.672
Pre-external	1.87	.95	1.00	4.67	1.235	1.175
Post-external	2.19	1.20	1.00	5	.810	-.410
F-external	2.01	.94	1.00	4	.754	-.632
Pre-amotivation	1.95	.97	1.00	5.50	1.819	4.503
Post-amotivation	2.18	1.34	1.00	5.50	1.366	.805
F-amotivation	1.92	1.01	1.00	5.00	1.670	2.98

Examination of the mean scores revealed that while the level of pre-service science teachers' identified regulation was the highest, the level of amotivation was the lowest. However, there was a decline in the level of pre-service science teachers' identified regulation from pre to follow up measures. This finding implied that students showed the environmentally friendly behaviors as they found them personally important, good and sensible before the course activities, but identified regulation decreased after the course. Concerning amotivation level, although there was an increase from pre to post measurement, follow up measure was comparable to pre measure. There was a decline on pre-service science teachers' amotivation toward environment scores five months following course. This finding showed that there was a decline in sense of helplessness regarding environment following the course. Examination of other subscales of MTES displayed that the level of pre-

service science teachers' intrinsic motivation increased following the course activities. Even there was a decline in intrinsic motivation scores from post to follow up measurement; follow up intrinsic motivation score was still higher than pre-intrinsic score. Moreover, integrated regulation value of students increased after the course activities and it did not change following the course. These findings displayed that pre-service science teachers showed the pro-environmental behaviors from the self not external control and their self-determined motivation that represents collectively intrinsic and integrated regulation increased after the course activities. Furthermore, while the level of introjected regulation of students decreased from pre to follow up measurements, there was an increase on external regulation level of students from pre to post measurement but, there was a decline in the scores from post to follow up measurement. This finding suggested that students showed the pro-environmental behaviors not to feel quilt or to attain an ego-boost. In other words, they showed the behaviors for extrinsic reasons but, this motivation type decreased after the course activities. Also, even there was an increase in external regulation values, it was still small. The descriptive results of AMTES subscales before, after and five months following the course are presented in table 4.2.

Table 4.2 Descriptive Statistics related to subscales of AMTES

	M	SD	Min	Max	Skewness	Kurtosis
Pre-strategy	3.22	1.63	1.00	7.00	.358	-.625
Post-strategy	2.99	1.20	1.00	5.00	-.126	-.910
F-strategy	3.34	1.49	1.00	6.50	.279	-.578
Pre-effort	3.16	1.51	1.00	6.75	.664	-.168
Post-effort	3.40	1.20	1.25	6.50	.425	.077
F-effort	3.08	1.56	1.00	6.75	.659	-.125
Pre-capacity	2.53	1.30	1.00	6.00	1.06	.692
Post-capacity	2.45	1.00	1.00	5.00	.371	-.362
F-capacity	2.13	1.02	1.00	5.00	.876	.488
Pre-helplessness	2.30	1.44	1.00	6.00	1.38	1.04
Post-helplessness	2.43	1.27	1.00	6.00	.946	.816
F-helplessness	1.96	.96	1.00	4.50	1.065	.478

Examination of the mean scores revealed that pre-service science teachers showed amotivation toward environment for different reasons. While the level of effort beliefs of students was the highest, the level of helplessness was the lowest. Students' effort beliefs increased after the course activities but, it decreased five months later and the follow up effort mean was smaller than pre-effort mean. This finding implied that pre-service science teachers were amotivated toward environment mainly because of lack of effort but, this belief decreased a bit following the course. Helplessness beliefs increased after the course activities and then again declined five months following the course. This may be commented like that when they learn the environmental problems during the course, they may feel helpless but the mean scores were really smaller than the highest mean value (7 point). Moreover, their strategy beliefs (believing the certain strategies are ineffective in producing some solutions) decreased after the course activities and then again increased five months later. This finding showed that their belief in the effectiveness of environmental strategies declined after the course activities. Their capacity beliefs (not believing successfully carry our certain behaviors) for

environmental behaviors declined after the course activities and in follow up measurement. Students believed that they had the capacity to perform pro-environmental behaviors. The descriptive statistics of autonomy, relatedness and basic psychological needs scales (daily needs satisfaction-DNSS) are presented in table 4.3.

Table 4.3 Descriptive Statistics related to autonomy and relatedness scales

	M	SD	Min	Max	Skewness	Kurtosis
Autonomy	5.58	.98	3.00	7.00	-.942	.806
Relatedness	5.12	.85	3.30	6.40	-.671	-.464
DNSS1	4.84	.70	3.89	6.33	.692	-.463
DNSS2	4.78	.72	3.44	6.33	-.111	-.239
DNSS3	4.83	.89	2.11	6.00	-1.154	1.853

*DNSS 1 is daily need satisfaction questionnaire administered in course week 4, DNSS 2 is daily need satisfaction questionnaire administered in course week 5 and DNSS 3 is daily need satisfaction questionnaire administered in course week 6.

According to Table 4.3, 7 point likert scale revealed that pre-service science teachers experienced reasonable level of autonomy and relatedness during the course activities.

4.1.2 Inferential Statistics

In this part, the results of four research questions are presented. One way repeated measure ANOVA was conducted to address first two research questions and canonical correlation analysis was conducted to answer the third research question. Finally, Pearson moment correlation was conducted to answer the last research question. Firstly, assumptions of repeated measures ANOVA are presented.

4.1.2.1 Assumptions of one way repeated measure ANOVA

Level of Measurement

The dependent variables; intrinsic motivation, integrated motivation, identified regulation, introjected regulation, external regulation, amotivation, capacity beliefs, effort beliefs, strategy beliefs and helplessness are considered as continuous variables and measured on interval scale. Therefore, the level of measurement is appropriate to conduct the analysis.

Normality

The skewness and kurtosis values for each motivation scales were checked. The difference scores lied between -2 and +2 as indicated in table 4.5 and 4.6. Therefore, normality assumption was met. However, five variables do not indicate normal distribution. As there are some outliers, mean and trimmed mean values of these variables were checked and it was explored that mean values were similar to each other. Therefore, outliers retained in the data

Table 4.4 Descriptive statistics for difference scores of pre, post and follow up motivation subscales.

	Skewness	Kurtosis
Intrinsicdif1	-.620	.795
Intrinsicdif2	2.801	10.440
Intrinsicdif3	1.220	2.680
Integrateddif1	.685	.077
Integrateddif2	.851	1.225
Integrateddif3	.712	.352
Introjecteddif1	-.117	.155
Introjecteddif2	.571	-.575
Introjecteddif3	.822	.264
Externaldif1	-1.001	1.511
Externaldif2	-1.202	1.2041
Externaldif3	-1.617	3.940
Amotivationdif1	-1.289	2.016
Amotivationdif2	-.510	1.524
Amotivationdif3	-.173	1.996

*Dif 1 refers the difference between pre and post scores, Dif 2 refer the difference between post-follow up scores and Dif 3 refers the difference between pre-follow up scores for each subscales.

Table 4.5 Descriptive statistics for difference scores of pre, post and follow up amotivation subscales.

	Skewness	Kurtosis
Capacitydif1	.078	.625
Capacitydif2	.071	1.199
Capacitydif3	.115	.889
Strategydif1	.556	-.250
Strategydif2	-.822	.426
Strategydif3	-.673	-.386
Effortdif1	.814	2.088
Effortdif2	-.174	.185
Effortdif3	-1.519	4.406
Helplessnessdif1	.693	4.204
Helplessnessdif2	.914	1.262
Helplessnessdif3	.125	.735

*Dif 1 refers the difference between pre and post scores, Dif 2 refers the difference between post-follow up scores and Dif 3 refers the difference between pre-follow up scores for each subscales.

4.1.2.2 Research Question 1

Is there a change in pre-service science teachers' motivation toward environment across the three time periods- before, after, and five-months later following the course activities?

Under this research question, subscales of motivation toward environment that are intrinsic motivation, integrated regulation, identified regulation, introjected regulation, external regulation and amotivation were examined.

One way Repeated Measures of Anova was conducted to address this research question. Before the conduction of analysis, assumptions of one way Repeated Measure of Anova were tested. Because the assumptions of intrinsic motivation were

violated, the Friedman test as the non-parametric alternative to the one way repeated analysis of variance was used, as well.

One Way Repeated Measure Anova

Repeated Measure Anova was conducted to compare students' motivation toward environment before, after and five months following the course activities.

According to one way repeated measures ANOVA results, there was not statistically significant difference on integrated regulation scores before, after and five months later following the course activities: Wilks Lambda= .88, $F_{(2,28)}$= 1.86, $p > 0.05$; on identified regulation : Wilks Lambda= .95, $F_{(2,28)}$= .751, $p>0.05$; on introjected regulation: Wilks Lambda= .93, $F_{(2,28)}$= 1.056, $p>0.05$; on external regulation: Wilks Lambda= .951, $F_{(2,28)}$= .715, $p >0.05$; on amotivation: Wilks lambda= .945, $F_{(2,28)}$= .809, $p>0.05$. As there was not statistically significant difference on above mentioned variables, pairwise comparisons were no checked. For intrinsic motivation score, Friedman test was used.

Friedman Test

The results of Friedman test indicated that there was a statistically significant difference in intrinsic motivation scores at the three time periods before, after and five months later following the course, X^2 $(2, n=30) = 10.42$, $p <0.05$). Inspection of median values showed an increase in pre-intrinsic motivation (Md= 5.25) to post-intrinsic motivation (Md= 5.88) and a further increase at follow-up (Md= 6.00). A Wilcoxon Signed Rank Test revealed a statistically significant increase in intrinsic motivation scores after the course, z= -2.210, $p <.0.05$ with medium effect size (r=.27) and five months later following the course, z= -2.173, $p <0.05$ with medium effect size (r=.28).

4.1.2.3. Research Question 2

Is there a change in pre-service science teachers' amotivation toward environment across the three time periods (before, after, and five-moths later the instruction supported by SDT guided activities)?

For this research question, subscales of amotivation toward environment that are amotivation because of strategy beliefs, capacity beliefs, effort beliefs and helplessness beliefs were examined. One way repeated measures ANOVA was conducted to examine the differences in these amotivation beliefs after and following the course activities.

One Way Repeated Measure Anova

Statistically significant interactions were only exploredon capacity beliefs (Wilks Lambda= .80, F (2, 28) = 3.406, p<.005, multivariate partial eta squared =. 19). It was found that there were statistically significant differences on pre- capacity beliefs, post-capacity beliefs and five months follow up capacity beliefs. However, the differences between pre and post measurement of capacity beliefs and pre and follow up measurement of capacity beliefs were not statistically significant.

The multivariate tests are showed in table 4.7 and the differences among capacity beliefs scores are presented in figure 4.1.

Table 4.6 Multivariate Tests (Capacity Beliefs)

Effect df	*Value*	*F*	*Hypothesis Eta squ.*	*Error df*	*Sig.*	*Partial*
Wilks Lambda	.80	3.406	2	28	.047	.196

Estimated Marginal Means of MEASURE_1
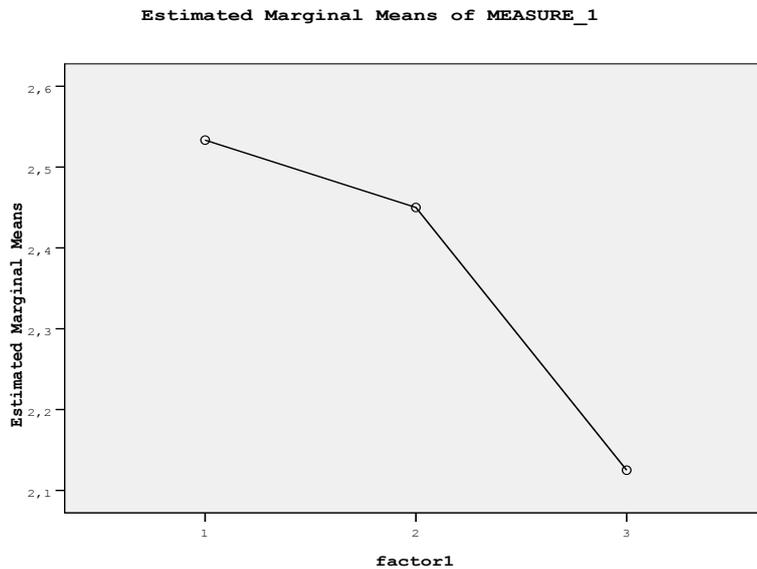
Figure 4.1 Capacity beliefs scores in three different times (pre-course activities, post-course activities and five months follow-up)

Students' negative beliefs in their capacity to implement environmental strategies effectively decreased after the course activities and this decline continued five months later following the course.

On the other hand, there were not statistically significant difference on strategy beliefs before, after and five months later following the course, Wilks lambda= .883, $F_{(2, 28)} = 1.857$, $p > 0.05$; on effort beliefs, Wilks lambda= .95, $F_{(2, 28)} = .751$, $p > 0.05$ and on helplessness beliefs, Wilks lambda= .87, $F_{(2, 28)} = 2.06$, $p > 0.05$. As there was not statistically significant difference on above mentioned variables, pairwise comparisons were not checked. The assumptions of helplessness beliefs were violated; the Friedman test was also used.

Friedman test:

For helplessness beliefs, Friedman test was performed since the assumptions were violated. The results of the Friedman test indicated that there was not statistically

significant difference in helplessness scores across the three time periods (before, after and five months later following the course), X^2 (2, n=30) = 4.701, p>0.05).

4.1.2.4 Research Question 3

Is there any relationship between self-determined motivation and basic psychological needs that were supported during the environmental activities?

In order to address this research question, Canonical Correlation Analysis was conducted. Correlation was performed between self-determined motivation variables (intrinsic motivation and integrated regulation) and two basic psychological needs variables (autonomy and relatedness). Set-1 included two basic psychological needs (autonomy and relatedness) and Set-2 included self-determined motivation (intrinsic motivation and integrated regulation) variables. Sense of competence was measured by whole system rubric (Cloud, 2005) that was used to assessproject work, but it was not effective in discriminating students with respect to competence beliefs since most of the students' responded in a similar fashion resulting in low variability.

Before conducting the analysis, underlying assumptions were checked and it was found that assumptions regarding linearity, normality and multicollinearity were met. 3 cases were found as missing data and they were deleted. According to Tabachnick and Fidell (2007), there should be about 10 cases for every variable for canonical correlation. This suggestion was satisfied in the present study.

Canonical correlation analysis revealed that the first canonical correlation was .42 (18 % overlapping variance). The two canonical variates in the data, on the other hand, did not account for significant relationship between the two sets of variables, yet they had correlation values higher than cut off value of .30. The reason of this non-significant finding, despite presence of the correlation values well-above the cut-off value, can be the small sample size. Therefore, this study should be replicated with a larger sample size to get more valid results. The canonical analysis results for

the current study are in Table 4.8. As shown in table, two sets of variables appear to be positively linked to each other. Relatedness (.91) and autonomy (.94) are positively correlated with intrinsic motivation (.64) and integrated regulation (.99). This means that pre-service science teachers whose need for autonomy and relatedness are satisfied while solving environmental problems during the course tend to have higher intrinsic motivation and integrated regulation toward environment.

Table 4.7 Correlations, Standardized Canonical Coefficients, Canonical Correlations, Percent's of Variance, and Redundancies betweenBasic Psychological Needs (Set 1) and Self-Determined Motivation Variables (Set 2) Variables and Their Corresponding Canonical Variates

| | First Canonical Variate | |
	Correlation	Coefficient
SET 1		
Relatedness	.91	.47
Autonomy .94	60	
% of Variance	12.75	
Redundancy	70.4	
SET 2	Correlation	Coefficient
Intrinsic motivation	.64	-.065
Integrated regulation	.99	1.043
% of Variance	15.7	
Redundancy	86.7	
Canonical correlation	.42	

4.1.2.5 Research Question 4

Is there any relationship between need for competence, autonomy and relatedness that were supported during the environmental activities? To answer this research question, three sub research questions were asked.

1. Is there any relationship between need for competence, autonomy and relatedness in the week of Ozone depletion? (DNSS1)

2. Is there any relationship between need for competence, autonomy and relatedness in the week of Ilısu dam project (Hasankeyf)? (DNSS2)

3. Is there any relationship between need for competence, autonomy and relatedness in the week of Mamak garbage dump? (DNSS3)

The basic psychological needs instrument (daily need satisfaction-DNSS) was conducted in these three weeks in turn; therefore, these research questions were investigated. In order to answer these research questions, Pearson product- moment correlation was conducted. Preliminary analysis was performed to ensure no violation of the assumptions of normality, linearity and homoscedasticity.

For the Ozone depletion week, there was a strong positive correlation between competence and relatedness, $r = .69$, $n=27$, $p < .005$ and there was also medium positive relationship between autonomy and competence, $r=. 39$, $n= 27$, $p <.005$.

For the Ilısu dam project (Hasankeyf) week, there was a strong positive relationship between competence and relatedness, $r= .75$, $n= 25$, $p < .005$.

For the Mamak garbage dump week, there was a strong positive relationship between competence and relatedness, $r= .73$, $n= 31$, $p <.005$.

4.2 Qualitative Results

Research Question 5: How pre-service science teachers' basic psychological needs were supported while solving environmental problems during the course"?

In this section, qualitative results of the study are presented to answer the above research question. This research question seeks some features that contribute to the satisfaction of PSTs' basic psychological needs which are competence, relatedness and autonomy while solving environmental problems during the course. In this way, how students' self determined motivation is fostered or not may be understood during the activities. Based on the SDT theory, each participant's interviews were analzed by using Glasser and Strauss (1967)'s qualitative analysis method namely open coding and constant comparative method. Eight codes and two categories were emerged from PSTs' interview responses. Four of the codes (collective construction of ideas, student guided discussion, real life connection and consistent group dynamic) were determined based on the previous work of Darner (2007) and the remainig four of the codes were emerged during the analysis and they were supported by the relevant literature (Deci & Ryan, 2004; Pelletier, 2004; Deci et al., 1991). These interview results were also supported by group discussions, reflections and assignments which were performed in each week.

4.2.1 Explanations of the Codes and Categories

Firstly, descriptions of the codes and categories are presented below. Then, in terms of each course week, PSTs' sample quotations fitting the codes and categories are exhibited. Following the quotations, consequences toward students' feelings of competence, relatedness and autonomy are presented. Whether PSTs' basic psychological needs were satisfied or not is explained for each course week. After the descriptions of the codes that are categorised as cognitive features are presented, the descriptions of the codes that are categorized as instructional features are given. The name of codes and categories are presented in the table 4.9.

Table 4.8 The codes and categories that support preservice science teachers' basic
psychological needs

Cognitive Features	Instructional Features
☐ Sense of Confidence in Action	☐ Collective Construction of Ideas
☐ Sense of Self Initiation	☐ Student Guided Discussion
☐ Awareness of Personal Role in the System	☐ Real Life Connection
☐ Awareness about Environmental Actions	☐ Consistent Group Dynamic

4.2.1.1 Cognitive Features

The codes including sense of confidence in action, sense of self initiation, awareness of personal role in the system and awareness about environmental actions were constructed under cognitive features category because all these codes include cognitive structures. The code namely sense of confidence is already defined as a cognitive structure in social cognitive theory by Bandura (1989). Sense of confidence enchances people's motivation and increases an interest in their performance (Benabou & Tirole, 2003). Moreover, sense of self initiation which is placedinself determination theory refers a cognitive structure in the literature (Hohwy, 2007). The last codes are about environmental awareness. Envrironmental awareness is defined ''as the knowing impact of human behavior on the environment and it includes both cognitive, knowledge based, affective-perception-based component'' (Kollymuss & Agyeman, 2002). During the problem solving activity, PSTs learnt about some environmental actios and discussed their personal role in the system; therefore, their awareness increased. In this study, it was believed that when these cognitive features

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were activated during the discussions and activities in the course, PSTs' basic psychological needs were satisfied.The four codes which represent to the category of cognitive features are presented below.

- **Sense of Confidence in Action:** Sense of confidence in action fosters individual's motivation to act and give a complete interest to perform a task (Benabou & Tirole, 2003). According to Deci and Ryan (2004, p.7), "need for competence refers a sense of confidence and effectance in action rather than an attained skill or capacity". Moreover, competence is related to being self efficacious, having sense of confidence and having the capacity to succeed a task (Bandura, 1977; Dweck, 1986; Skinner, Wellborn & Connel, 1990). If students feel confident for engaging in a task, they possibly choose to participate in the task and their sense of competence is satisfied.

- **Sense of Self Initiation:**Sense of self initiation is not an externally initiated movement. Conversely, it is a movement coming from self (Hohwy, 2007).Deci, Eghrari, Patrick, and Leone (1994) claimed that internalization contributed to self intiated behavior and self reported value. These social conditions contributes need satisfaction. Feeling initiative supports people's need for autonomy because their behavior does not come from an external force (Deci & Ryan, 2004, p.8).

- **Awareness of Personal Role in the System:**If individuals understand their own role in a process in which they try to find solutions for an environmental problem,, they could feel more competent to solve the problems (Darner, 2007). In this study, it was explored whether they were aware of their role in the system or not while solving the problems. This code refers that individuals become aware of their role in both the outcomes of the problem and the solutions for the problem.

- **Awareness about Environmental Actions:** "With regard to environment, critical socio-contextual factors such as goverment approach to implementation of environmental programs and strategies but also, the behaviors of people in a relatively close social environment (friends, children, educators, etc.) could represent a daily source of influence on motivation towards pro-environmental behaviors"(Pelletier, 2004, p.221). According to SDT, these factors increase people's connectedness to the community and support their sense of relatedness (Pelletier, 2004, p. 221). In this study, PSTs' awareness about environmental actions during the problem solving was investigated.

4.2.1.2 Instructional Features

Four codes that are collective construction of ideas, student guided discussion, real life connection, consistent group dynamic were related to instruction and they were called as instructional features. They were examined whether they support PSTs' basic psychological needs or not during the instruction (discussions and activities). The four codes which were categorized under instructional features are presented below.

- **Collective Construction of Ideas:**This code refers tomix the ideas together to make one single idea. The groups examined all of the ideas and devised a solution to the problem. By working together, they can collectively construct solutions by revising each students's perspective and they can learn different aspects of the problem from eachother's comments (Darner, 2007). During the class discussions, they were asked the reasons and solutions of the problem sets and they discussed different aspects of the problems and collectively constructed ideas. This code may indicate that their sense of relatedness was supported during the discussions.

- **Student Guided Discussion:** The second code is student guided discussion. *"It is a whole-class discussion in which pertinent information comes from the students, rather than the instructor"* (Darner, 2007). The students learn from eachother and instructor guides them during the discussions. This feature supports students' need for autonomy and relatedness because the instructor does not give the solutions directly instead he or she guides them during the discussions (Darner, 2007). Moreover, students help eachother learn better.

- **Real Life Connection:** During the interview transcripts, many PSTs talked about the problems that are connected to their real life and therefore, they help their learning. They see a connection between the problems and everyday situations. Furthermore, when they think about their daily life desicions to improve the environment, they feel self determined toward pro-environmental behaviors and their basic psychological needs are supported (Darner, 2007).

- **Consistent group dynamic:** When students study with the same group friends or a consistent group, their basic psychological needs are supported. This feature supports their need for relatedness because they feel a sense of belonging to the group friends (Darner, 2007). CGD supports also need for competence because group friends allow eachother to share ideas while solving the problems. If they felt a lack of relatedness, they wouldn't share their ideas.

4.2.2 The Sample Excerpts of PSTs for Each Course Week

In this part of the qualitative results, focus group participants' sample excerpts from their interview responses, discussions, assignments and reflection papers were presented for each week.

4.2.2.1 Summary of the Findings for COURSE WEEK 1

In that week of the course, PSTs were given two problem sets (Easter Island and Environment vs Economy). The comments of participants (interview responses, group discussions and assignments) regarding two problems are given together. Sample excerpts from PSTs' interview responses, assignments and discussions are presented below.

❖ **Focus Group Interview Responses:**

• **Awareness of personal role in the system:**

While PSTs argued about two problem sets,they realized their personel role in the problems. For example, Ceyda mentioned about their role in the current environmental problems while discussing Easter Island problem as in below:

> C: In these years, people could be unconscious or they could leave their sources and go to other places and they could begin to a new life. However, today, this is not possible so, we have to use (our sources) consciously. We need to consume in a conscious way. We made a project about sustainability before. We need to use and consume in a sustainable way. This situation continues even if many years passed. We have to plan our actions as taking an example of this case.

Sanem also commented on her role where she noticed that they (group friends) can live the same problems like in Easter Island today as in below:

> S: Actually, thanks to this case, we saw a concrete example that is happening in our environment but we are not aware of it. After we read the case, we thought that this kind of things are happening today, too and we may live the same situation in the future

I asked PSTs *whether solving this problem is important or not and if it is not given in the course, is it still important for them*? As an answer of this question, Yeliz pointed her personal role in the system in the Easter Island problem as in below:

Y: We tried to put ourselves into place of these island inhabitants. What would happen if we were there? We thought our needs and our consumption habits here. We thought that if we live in a more luxury way, what would happen? We would harm nature more. We saw that people harm nature for their needs and to live in a higher standard life not just sustain their life.

Above statements demonstrated that participants were aware of their role in the system and they felt competent. They combined the problem to today's environmental situation. For example, Ceyda said that they had to plan their actions to save the environment and Yeliz questioned her lifestyle and consumption habits.

- **Awareness about Environmental Actions:**

In environment versus economy problem, Muge mentioned about they questioned whether people can reach to a sustainable life or not in the course. I asked her whether this is possible or not and her answer is presented in the below quote:

M: It is difficult now because technology and industry are developing incredibly. I do not believe it but, in a workshop I attended, I was really surprised. People who are living in an ecovillage came to the workshop. There were people who were experts in this subject. They were doing composting and recycling in their houses.

In environment vs. economy problem, Yeliz talked about environmental organizations and she said that they should take precautions. Her answer is given in below quote:

Y: I thought what we can do. I thought that people should give their interests to this issue for a sustainable life. We talked about this with Sanem and Ece. International precautions are necessary. This sustainability concept should be common everywhere like some environmental organizations.

In this course week, the code of awareness about environmental actions was not emerged in all of the participants' comments. Muge mentioned about the ecovillages. She said that she was very effected from these organizations. If she becomes aware

of these organizations, her need for relatedness can be supported since she feels more connectedness to her community. This problem is not about ecovillages but it induced her to think about ecovillages. Yeliz also began to think about environmental organizations to reach a sustainable life but it is difficult to say her sense of relatedness was supported with regard to her comments.

- **Sense of Self Initiation:**

In the economy versus environment problem, I asked participants what helped them while solving the problem. Ceyda gave the below answer during the interview:

> C: We thought what can be done while producing solutions. We thought that every invidiual should make a sacrifice to decrease this damage. Sanem said that this (consumption) is a craziness and everyone needs psychological support. Our instructor asked us if we have 500.000 TL, would we buy a new house or an old house?Many people said that they would buy a new house. Every individuals should make a sacrifice. This question made us more aware. We think more what I can do instead of saying that this should be done or not.

I asked Sanem what her favorite part of this activity was today (economy vs environment problem).Her answer is presented in below quote:

> S: It was nice to know something from my life in this case. Actually I was aware and I could warn people in my community.

Moreover, when I asked Sanem how this helped her, she gave the below answer:

> S: Actually, it was useful for me but, I can provide benefit for the environment by warning people in my community.

As demonstrated in the above statements, participants felt self initiative in this course week. They thought that what can be done to overcome excessive consumption. Moreover, they firstly were aware of their personel role and then, they started to

think what can be done. To feel autonomous, individuals should feel competence, too.

- **Collective Construction of Ideas:**

I asked participants *whether their suggestions were taken seriously by their group mates during the discussions.* Ceyda gave her answer about the Easter Island problem as in below:

> C: We always study together so, one's idea may be effective on the other's ideas or it evokes other things and provide to make comments. We get on very well. We evaluate our ideas and thenmake comments.

Moreover, I asked participants while solving the problem (Easter Island), what helped them. The answer of Ece is presented in below quote:

> E: Our instructors and friends' comments guided us. When I think something, I see that a friend's idea is more sensible then, I think about it and I try to relate it to my ideas.

When I asked participants *whether they effecively contributed to discussions in the course or not.* Sanem presented the below answer:

> S: Yes I did. For example, we easily explained the reasons for the first question (what environmental concerns may be in economy vs environment case). Not only I but also my friends explained the reasons. I said air pollution, a friend of ours said water pollution. We talked about all of them affect eachother. Then, we talked about the harm of fertilizers and also economical ambition.

Sanem also mentioned about the effectiveness of group working and her comment is presented in below quote:

> S:Studying with friends is very effective. Someone may explain the thing that I did not know and we complete eachother in this way.

Above excerpts indicated that participants collectively constructed their ideas. They examined each person's ideas in the group and they decided what may be the answer of the questions. They also stated that group working contributed to their learning so, I can say that their need for relatedness was fostered in this week.

- **Student Guided Discussion:**

I asked participants *what their favourite part was in this week*. Ece pointed out she liked group discussions as in below:

> E: Based on the discussions, that everybody has different ideas is nice. Our instructor asked us if we have money, would we buy a new house or an old house? One of our friends from other groups said that their group wants to have a new house because there will be heat insulation and it will provide energy saving. I would not say like they said but getting this idea made me to think more; therefore, I liked these discussions.

Muge also commented on group discussion as in below:

> M: After the discussions finished (she is talking about group discussions), the ideas of each group were taken and the ideas were combined. This was enjoyable.

I asked *how this situation contributed to her* (Muge). Her answer is presented in below quote:

> M: We learn different opinions and there may be people who think differently.I mean that this kind of socialization in the class is more enjoyable and useful.

Some of the participants talked about group discussions in the classroom and they found these discussions were enjoyable and useful. I can infer that their need for autonomy and relatedness were satisfied in this week.

- **Real Life Connection:**

I asked Sanem *what she really liked in the problem* (Easter Island). She gave the below answer:

> S: It was combined to real life. It leaded us to compare past and today and increased our awareness.

I asked Muge whether she thought she could effectively contributed to solving the problem or not. She made the comment as in below:

> M: Yeah. I made a contribution for each question. I gave an example here. It asks us whether it (the story of island) may be a lesson for today. Of course, it may be. The drought in Konya plain because of agriculture should be a lesson for today. I thought what may be done to save Konya plain. I said that daily life is important. It is directly related to this. 4.5 billion people live in the world and if everyone does the same thing or think about it, it creates a great synergy.

With regard to these two problems, PSTs' sense of relatedness may be suppoted because they saw the connection between today and past and they tried to think solutions for today by taking lessons from the past. Sanem mentioned about when the problem was connected to real life, it increased their awareness.

- ❖ **Focus Group Discussions (Audio Recordings) and Assignments:**

I also examined PSTs' activity sheets to compare their responses in the interview and their comments in the classroom. In this week, students' discussions were audiotaped but because of technical problems, recording could not be used so, I will just give some of their responses in the activity sheets. The codes that are *awareness of personal role in the system and awareness about environmental actions* were emerged in the discussions.

They answered the questions in the discussions: *If we continue to consume world resources as we currently do, will we encounter the same situation as Easter Island? What do you think about this issue*? Focus group members's explanation is presented in below quote:

> FG: We will encounter the same situation like islanders. We consume water resources unconsciously and for only our comfort. Each person has own car and they use deodorant, detergants. Since we overuse the sources, we face serious problems like global warming, drought etc...

Another questions that they answered: *How can people live harmoniously with nature? Do you think present environmental preservation efforts are sufficient? Can we achieve a sustainable life*? Focus group members's explanation is presented in below quote:

> FG: Present efforts for environmental protections are not sufficient, but people people should gain interest and knowledge to achieve a sustainable life. It is possible. International precautions can be taken all over the world.

PSTs were aware of their personal role and environmental actions in the world. They could easily compare today and the past. Combining today and the past may foster PSTs' relatedness because when they saw today' problems and their reasons they could feel part of the solution. However, to achieve a sustainable life, they considered environmental actions are necessary.

In the assignments for this week, Ece investigated the threats on Beyşehir lake in Konya, Turkey. Ceyda investigated the effects of global warming on Polar Bears. Yeliz investigated environmental degradation in Maldives located in Indian Ocean. Sanem investigated Mayan Mysteries. Lastly, Muge investigated Pollution in Gange River in India.Based on the comments in assignments, some of them explained that they were *aware of their role in the system.*For example, Muge pointed out her role in her assignment as in below:

M: As we see in this environmental degradation example, daily life habits and even the religion of the human beings affect nature so dramatically. I can easily say that for this and all the other ecology examples, we as inhabitants of this planet, have to be very careful about our nature which means our future, we have to change our mentality and customs and the governments should lay down new laws for the industries and industrial pollutants to protect the environment.

The summary of the findings of course week 1 is presented in table 4.10

Table 4.9 The frequencies of codes emerged in week1

Course Week 1	
The Codes	**Frequency of Codes**
Sense of Confidence in Action	0
Awareness of Personal Role in the System	7
Awareness about Environmental Actions	4
Sense of Self Initiation	3
Collective Construction of Ideas	8
Student Guided Discussion	4
Real Life Connection	2
Consistent Group Dynamic	0

In this week, sense of confidence in action and consistent group dynamic codes were not emerged. Participants did not give any evidence about these codes directly.

They did not hesistate to share their ideas in the group. Furthermore, when they were aware of their personal role, they also felt initiative and they wanted to act for the environment and they felt both competent and autonomous. Moreover, they said that they need support from outsideto act for the environment,. To feel competent, their sense of relatedness should be fostered. They also explained that group discussions helped their learning and therefore, they liked this part of the course.

4.2.2.2 Summary of the Findings for COURSE WEEK 2

In this course week, the problem namely paper vs plastic was discussed. Sample excerpts from PSTs' interview responses, assignments and discussions are presented below.

- ❖ **Focus Group Interview Responses:**

- ❖ **Awareness of Personnel Role in the System:**

I asked Yeliz *what she really liked during the discussions in this course week*. Her answer is presented in below representative quote:

> Y: Hmmm, We learned many things again. I liked all of them. I was surprised to think about the last question. What is the solution? There is not a kind of solution. (Paper vs Plastic, third question-Appendix A).

> R: You still think?

> Y: Yeah, I am thinking. How can we change our lifestlye? I try to change on my own but, I sometimes say that only will I save the earth. I am doing but, nobody does.

Ceyda also described her role in this problem as presented in below quote:

> C: After this issue, I became more consicious. When I consume something, I am saying that I can use this one more and keeping it for reusing. I think I became aware even in one week.

Ece also mentioned about her personel role in the problem:

> E: After you said in the course, I paid attention something. For example, we are careful at home. We seperate plastics. When I came here, there are two options as paper and plastic cups. I never think this situation before. I thought now. I prefer plastic cup for tea because, I do not like tea in paper cup. I behaved like a person who loves luxury. Now, I will make a change on my self. If I do something, I should do properly.

Some of the participants described that their personal awareness increased. For example, Ece said that she wanted to change her habits. Based on Yeliz's comments, in order to satisfy her relatedness, she needs other people's support even if she is environmentally active and aware of her role in the system.

❖ **Awareness about Environmental Actions:**

Ece mentioned about guest speaker who came to class this week to explain environmental action plans:

> E: We were so much influenced from the presentation (guest speaker's presentation). When we heard about action plans that guest speaker explained, we wanted to make a plan. We had some plans and I hope they become real. I think we do something.

Other participants didn't talk about environmental actions. However, Ece said that all of them was so much influenced. Learning about action plans initiated them. They wanted to make their own action plans.

❖ **Sense of Self Initiation:**

This code was first emerged from Ceyda's interview response. She said that her awareness increased in one week in her previous speech. She presented an example about her habit as given below quote:

> C: For example, we can use plastic bags while shopping but, we can use the same bag like the bag you showed us and we can reduce its usage. Paper bags are used more in abroad but, they may tear up and when they are recycled, they will not be the same and new trees will be cut so, we decided that it is not environmentally friendly.

I asked participants *what they really liked during the discussions in the course week*. Sanem presented the below answer:

S: When I listened about how to make an action plan from guest speaker, I thought that we can make this kind of plan, a campaing. Some people may be responsible for this work and using cloth bags may be widespread everywhere. We dreamed it. This dream may be real.

Above statements demonstrated that participants wanted to be active after this problem was given. The felt autonomous because they made their own decisions about the pro-environmental behaviors.

- **Collective Construction of Ideas:**

I asked participants *what helped them while solving the problem* and Ceyda commented on collectively construction of ideas as in the below quote:

C: We are learning by supporting eachother's ideas. When someone makes a comment, other ideas come to our mind. We combined all these ideas. Of course, each of us contributed to the problem. One's ideas promoted others' ideas and leaded to think new things. This is like that in every question.

Yeliz also described that they reached a common solution during the discussion. Her comment is given as in the below quote:

Y: We found a common solution. We said that we do not use both of them or we use them in a minumum level. We said that we should increase using of cloth bag. We agree of this idea.

They pointed out that they collectively constructed their ideas and produced a common solution.

- **Student Guided Discussion:**

I asked participants *what they really liked during the discussions*. Ceyda presented her answer as in the below represetative quote:

C: I really liked the last evaluations in the course. This week we said a different thing from other groups. Everbody prefered the paper. There may be differences. We are learning the things we don't know. Sharing ideas at the end of the course were effective and I liked mostly this part.

I asked participants *whether they think that they could effectively contribute to solving of the problem.* Sanem commented on her contribution to the discussion as in the below quote:

S: When I give this suggestion or information there (paper and cutting of trees), I consider that I made an effective contribution.

When I asked participants *what they really liked during the discussions in this week.* The answer of Ece is given as in the below quote:

E: It is nice to hear different ideas. Everybody said that we would not use paper but, we said the different thing. We said that we would use plastic. It was nice to think a different thing and make contribution to them. Firstly, we thought paper but, we also thought the plastic side and it was nice to show this side to people.

Above sample quotations indicated that PSTs liked whole class discussion which was performed at the end of the course. I can say that their need for competence and relatedness were supported because they thought that they made an effective contribution in the class and they liked sharing ideas.

- **Real Life Connection:**

PSTs expressed that this problem was so close to their real life and they gave some examples from their real life

For example, Ceyda made the below comment:

> C: Actually, it is from causal life. We always consume and waste. There are many recycling bins in the dormitory. Mostly, we do not see recycling bins in other places. I sometimes do shopping and when I return home, I am thinking what I will do with these things. Since we always live these things, we are contibuting.

Ece also commented on real life as in the below quote:

> E: It is an important subject. When we start to talk about these issues, we start to think more. Anymore, we started to find out these issues in our daily life.

PSTs connected the problem to their real life and they made more contributions to the problem. Thus, their need for competence was supported.

- **Consistent Group Dynamic:**

Ece pointed out the importance of consistent group dynamic as in the below representative quote:

> E: I do not hesitate saying of my ideas in the group because we are in a friends' group. I know that people will not mock with me.

She refers that her sense of relatedness was supported because she didn't hesitate sharing of her ideas.

- ❖ **Focus group discussions (Audio Recordings) and Assignments:**

This problem was completely related to individuals' decisions and behaviors toward environment. Therefore, PSTs discussed about their habits and their role in the problem.

- **Awareness of personal role in the system:**

This code was moslty emerged from PSTs' group dicussions. Focus group members argued about plastic and paper usage and their comments in the group discussions are given in the below quote:

> Sanem: We chose plastics.
> Yeliz: Because it can be used again and again.
> Sanem: Plastics can not be recycled as easily as paper. It is better to use plasics insead of cutting many trees for paper.
> Yeliz: We should not use so many plastics. They are harmful to nature.
> Ceyda: We should possibly reduce.
> Ece: There are reusable plastic bags in the markets. We can use them.
> Sanem: Of course, it should be a habit. If there is no habit, there will be many plastic bags in the houses.

They talked about their role in the solution of the problem. They believed that if people gain habit about this isse, then the problem may be solved.

In this week, PSTs made a group work in which they prepared a video. Yet, this assignment was not examined. The summary of the findings of course week 2 is given in table 4.11.

Table 4.10 The frequencies of codes emerged from week 2.

Course Week 2	
The Codes	**Frequency of Codes**
Sense of Confidence in Action	0
Awareness of Personel role in the System	5
Awareness about Environmental Actions	1
Sense of Self Initiation	4
Collective Construction of Ideas	4
Student Guided Discussion	2
Real Life Connection	3
Consistent Group Dynamic	1

In this week, the codes namely sense of confidence in action was not emerged. As PSTs' comments demonstrated that as the problem was connected to their real life, they could make contribution during the discussions and they felt competent. The code namely consistent group dynamic was found in this week. One of them said that as she was in a friend group, she didn't hesitate sharing her ideas.

4.2.2.3 Summary of the Findings for COURSE WEEK 3

The problem that was discussed in this week was why worry about extinction? Sample excerpts from PSTs' interview responses, discussions and assignments are presented below.

- **Focus Group Interview Responses:**

- **Sense of Confidence in Action:**

This cognitive feature first emerged from Ece's responses in the interviews. She talked about the question in the problem sheet that was "*What would you do to save these species"?* She presented her answer as in the below quote:

> E: Actually, I would not believe to do sth as individual. I think many people do not take action because they do not believe, but after taking this course, I became more sensitive to my environment. I believed that I can do something so, when I confronted a problem like that, I can take step and I can try to do something.

On the other hand, Sanemgave a different answer as shown in the below quote:

> S: I do not think that I can be effective on my own so, I could not handle but if I can increase awareness of people in my community and I can gain their support, I can overcome it.

Ece believed that she can act to save the species and felt more confident in taking action so, I can say that she felt competent in this week.Sanem also felt confident in taking action but, she needs other people's support to take action. Therefore, as she felt competent, her sense of relatedness should be satisfied. Other participants didn't say anything about whether their sense of confidence in action was fostered or not.

- **Sense of Self Initiation**

One of the questions which participants answered was what they could do to protect the species. Ece described what she can do to protect the species as in the below quote:

> E: I would start to organize my closest friends and we would take action. Union gives strentgh. You could not do so much things as an individual because it is difficult to overcome companies. We should do something to make people aware. We can make an organization.

Sanemalso explained what they could do for the environment and she gave the below answer:

> S: First of all, we should examine the issue in detailed. Then, for example, as we are five people as group we can inform other people about this issue from class to school and we can make people aware about the issue. If everything is ok, we can apply to formal institutions. We can get help of non-govermental organizations like Doğa Derneği, Green peace etc and then we can apply to goverment institutions.

As above excerpts demonstrated that participants felt initiative in this week and they wanted to take action. They explained what they can do to save species. I can say that they felt autonomous because they made up their own mind.

- **Awareness of Personal Role in the System**:

I asked participants during the interview : *Did you feel like solving this problem was important? If you weren't asked to solve the problem in the class, would it still be important to you? Why or why not*? Muge presented her answer as in the below quote:

> M: This extinction problem worries me very much. I really more take attention it among other environmental issues.

Furthermore, Ceyda explained the importance of the problem as in the below quote:

> C: Of course, I am giving importance to this issue because we are the reasons of the extinction of these species. They are generally vanished because of human based reasons. They need us. We should do something to defend their rights and to protect them.

Participants explained their role in the extinction problem and they mentione about they should do something to solve this problem. They were aware of their personal role.

- **Awareness about Environmental Actions:**

Participants also discussed about the environmental organizations in this week. For example, Ece emphasized that her awareness about environmental organizations increased as in below:

> E:Actually until this time, I was not aware of these kind of things. I did not make any research about them. I always hear about Green Peace, Nature Society (a non-govermental organization), but I have never searched or listened their works. I firstly listened our guest speaker who talked about Nature Society (Doğa Derneği). I will read and search about them after that. Until this time I am not interested in them. Now, I know about them and I will easily understand what I read and I can be more positive after that.

Yeliz also commented on this issue as in the below quote:

> Y: Yes, we were interested in the things which guest speaker from Nature Societyexplained. Especially, we were very interested in that he graduated from math and became an expert in biology. I have not known how Nature Society was effective before. I learnt about their works.

Above statements showed that participants learnt about environmental organizations and their awareness increased. When they read and learn about these organizations, their need for relatedness may be supported.

- **Collective Construction of Ideas:**

I asked PST *what helped them while solving this problem*. Ece mentioned that they collectively constructed ideas as in below.

> E: Yes, Actually, we make brainstorming. An idea that does not come into one's mind comes to another person's mind and then, they are collected.

When I asked participants *"Do you think that you contributed to the discussion effectively in this week"?*Yeliz explained that they conributed equally and she gave the below answer:

> Y: I think that we all contributed equally because we had less information about endangered species. For example, I mentioned about green peace since I have followed their news more and I have known about them

- **Real Life Connection:**

I asked participants*what they liked the most in the problem*. Muge's answer is presented as in the below quote:

M: I like these kind of cases. I support case studies in the course. Especially, these cases are from real life and so, they are nice because they leaded people to make brainstorming. Therefore, I like this course.

Muge stated that she generally liked the course because the cases are from real life and help her discuss. Therefore, I can say that she felt competent.

- **Student Guided Discussion:**

I asked participants *what they liked most in the problem*? Ece pointed out that she liked learning different ideas from her friends as in below:

> E: That everybody has an idea and a suggestion in this course is nice. It is beatiful to hear other group friends' ideas. It is good to see that other friends know something which I couldn't think or my group friends couldn't. I like everybody knows something and they have an idea. I like sharing ideas.

I asked participants *what helped them while solving the problem.* Ceyda's answer is given as in the below quote:

> C: The course instructor and your comments and my group mates' comments helped me while solving the problem. One of my group mates explained that okaliptus trees threatened some species at its surrounding because they used much more water. I learnt this knowledge from my friends. It was beneficial for me.

- ❖ **Focus Group Discussions (audio recordings) and Assignments:**

Participants described their role and its importance in the system in their discussions and activity sheets. They answered the question that is "Should we save the species from extinction? Why or why not? What is the value of having a lot of biodiversity"? They answered this question as in the below quote:

> FG: We should save them to save the existing balance. If one part of the system is changed, it affects the whole system. Also, we are part of the chain.

During the discussions, Muge said that people don't take action on their own but, they can warn municipality. Ece asked them whether they will really do this and she said that they should be honest. Muge again said that of course they will do. Ece

saidthat people may be aware of this issue, but they may think that anything will not be changed or they will think what they can do by themselves. Moreover, she said that they (group friends) should not be like that and her group mates supported her comment. Lastly, Semra said that they should take action.

They were *aware of their personal role in the system* and they felt *sense of self initiation* during the discussion. They said that they should take action. I can say that their sense of competence and autonomy were supported in this week.

For the third assignment, Ceyda investigated Apollo Butterfly as an endangered species. Sanem investigated The Disappearance of World Agricultural Honeybee.Ece investigated Sea Otter Decline. Yağmur investigated species extinction as general and lastly, Muge investigated the extinction of Siberian Tiger.

- *Awareness of personal role in the systemand sense of self initiation* were also emerged from PSTs' assignments. For example, Ceyda and Muge made the below comments in their assignments:

  C: We must take precautions such as decreasing CO_2 oscillation and we must protect the areas where butterfly lives. In Turkey, they are living in Uludağ and we must take action before they are gone totally.

  M: We, as the inhabitants of this planet, should be very careful about what we can do to stop giving harm to the species and we should protect them from becoming extinct or threatened. Firstly, we should be aware of the importance of biodiversity which means every species in the nature has a value and necessity.

As seen in some PSTs' writtings, they knew that the extinction of species were mostly human based and they were aware of their role in the system. In addition, they felt initative because they mentioned what they can do for the environment in their assignments. I can infer thattheir need for competence and autonomy were supported.The summary of the findings of the course week 3 is given in table 4.12.

Table 4.11 The frequencies of codes emerged from week 3.

Course Week 3	
The Codes	**Frequency of Codes**
Sense of Confidence in Action	2
Awareness of Personal Role in the System	8
Awareness about Environmental Actions	3
Sense of Self Initiation	5
Collective Construction of Ideas	6
Student Guided Discussion	3
Real Life Connection	2
Consistent Group Dynamic	0

In this week, the codes that were emerged from PSTs' comments indicated that their basic psychological needs (competence, autonomy and relatedness) were supported. They were aware of their personal role and they wanted to act to solve this problem. They felt initiative and confident in taking action. Until this course week, they did not say that they felt confident in taking action. In this week, they stated that they believed themselves to do something to protect the environment. They also explained that they liked the problems and sharing ideas with the other groups.

4.2.2.4 Summary of the Findings for COURSE WEEK 4

In this week, PSTs discussed the problem of ozone depletion. All focus group members attended the class but the discussion part lasted shorter and two of the participants couldn't participate in interviewing process because they were not appropriate.

Moreover, there was no assignment in this course week. PSTs were also given basic pscyhological needs' instrument to measure their need for competence, relatedness and autonomy.

❖ **Focus groups' Interview Responses**

• **Awareness of Personnel Role in the System:**

I asked participants what they talked about during the dicussion. Ece explained what they discussed in this week and she mentioned their role in the problem as in below:

> E: We tried to think about the things causing CFC emissions. I mean that what could cause to its emissions. We tried to think the best way to reduce using of these devices (including CFC). We also thought that more countries should sign this protocol and it should be applied in more countries.

• **Awareness about Environmental Actions**

Sanem talked about the problem and she made the below comment:

> S: Can we change people's habits? We saw that we can change them by mean of this example you gave us. This is really performed.

This success story helped Sanem think about chaning habits. She learnt that it would be possible.

• **Real Life Connection:**

I asked participants *whether they think that the problem was important or not and if it wasn't given in the course, was it still important for them*? Sanem's answer is presented in the below quote:

> S: Indeed, it has so much effect in our daily life. For example, a relative of mine becoming a skin cancer may direct people on this issue. Why it may be? Of course, there are other factors. There are many cosmetics. This issues may come into people's mind.

I asked participants *what they liked most in the problem*? Sanem answered this question as in below:

> S: When I evaluate in general, we obtain these information but, we couldn't know how to connect to our daily life. We realized this thanks to this course. We could connect to real life. There are information in our mind but, as long as they weren't asked to us, they have never talked. Throught this course, I say that aa yeah I know this. It satisfies me. We learn many things we didn't know.

- **Student Guided Discussion:**

I asked *what helped them when they are solving the problem*. Sanem mentioned their group friends' contributions as in below:

> S: Absolutely, the article Muge read before was effective. Moreover, there was my prior knowledge about deodorants and air conditioners. Of course, the things we talked in the course were very effective. We are learning new things permanently. I realized that I had some lack of information and I completed it.

I asked *what they liked most in the problem*. Ece pointed out that group discussions helped her learning as in the below quote:

> E: I liked the class discussions. I really learn the things I didn't know before.

❖ **Focus Group Dicussions (audio recordings) and Assignments:**

The third question in the problem was that:*Is it really possible for people to change their habits? Why or why not? What does the ozone depletion story indicate*? The codes and sample excerpts of focus group members are presented in below.

- **Sense of Confidence in Action:**

Focus group members discussed about their habits and the success story given in the course and they made the below conversation.

> E: Do you think that this kind of lifestyle is possible ?
> S: We should change habits.
> E: It is possible for me but, it seems like a dream.
> S: In the problem, we saw that it is possible.
> R: What did you understand in the case? Did they reach the solution?
> S: possible
> E: They reached to solution.
> C: Then, we say that it is possible
> S: In the last sentence, it is saying that it was reduced
> E: This protocol shows that something is going well
> M: so, possible to reduce

They felt confidentafter they see the positive example from the case. They believed that they can reduce CFC's effect or the effect of other problems and therefore, they felt competent.

- **Real life connection:**

Moreover, they connected the problem into their real life. They thought what environmentally friendly things may be from their real life so, they also felt self determined toward pro-environmental behaviors. The sample quotes from focus group members are given below.

> Y: For example, to reduce deodorant usage, we should use something that is an alternative, environmentally friendly instead of them. For instance, do rollons have the same effect?
> E: They cause cancer. Lipsticks also cause cancer.
> C: What are we gonna do?
> S: But, there are blubber in lipsticks.They kill animals.
> E: Do you think that it is possible?
> C: Yes, it is possible
> S: Me too, but, what can we do?
> Y: Alternative devices are necessary.

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S: Look, I thought that ventilator may be used instead of air conditioners.
M: Hmm, yeah it is less harmful
S: It gives less harm
C: How does air conditioner give harm? It is about gases?
M: CFCs are used in air conditioners.

They saw the connection between the problem and their daily life.They felt competent in this week because they believed that these solutions that they found are possible.The summary of the findings of course week 4 is presented in table 4.13.

Table 4.12 The frequencies of codes emerged from week 4.

Course Week 4	
The Codes	**Frequency of Codes**
Sense of Confidence in Action	1
Awareness of Personal Role in the System	1
Awareness about Environmental Actions	1
Sense of Self Initiation	0
Collective Construction of Ideas	0
Student Guided Discussion	4
Real Life Connection	3
Consistent Group Dynamic	0

The discussions related to ozone depletion problem in this week lasted shorter because there was limited time. Therefore, participants couldn't have a chance to speak more during the discussions and following interviews. However, their comments demonstrated that they felt mostly competent in this week since they learnt a completed action and a success story.

4.2.2.5 Summary of the Findings for COURSE WEEK 5

In this course week, PSTs argued about Ilısu dam project (Hasankeyf) that is a controversial issue and an ongoing environmental problem in Turkey. Sample excerpts from PSTs' interview responses, assignments and discussion are presented below. In additon, basic pscyhological needs instrument was conducted in this course week.

❖ **Focus group Interview Responses**

- **Awareness of Personal Role in the System:**

When I asked *what they talked about during the discussions*. Ece's answer is presented in the below quote:

> E: We tried to think about species there. We thought that species will be extinct. Actually, protecting the history of Hasankeyf provides protecting species because construting of a dam means completely changing lifestyle. I mean that a bird may not live there. It leaves there and looks for a new place because we changed the place. Moreover, according to case, dams are built for fifty years. Water need will not finish after fifty years. The need for dams will not finish. Therefore, there will be destruction in another places. More long lasting solutions are necessary.

Yeliz said that she liked the question which is:*if you took part in a Hasankeyf conservation project, what would you do*? and she made the below comment:

> Y: I thought what I would do if I took part in a this kind of project. I thought whether I could be effective? I liked this.

Moreover, Sanem mentioned that her awareness started to increase during the dicussions and she made the below comment:

S: We started to be conscious after the course. Yeah, we started to gain awareness toward environment. Aftet that, I am thinking when I hear these issues. I try to make my own inferences so that would it be better what if it is not like that.

Above statements demonstrated that particpants were aware of their role. Yeliz is not sure whether she could be effective or not to act for Hasankeyf, but Sanem felt more competent because she also started to think what is better for the environment more.

- **Sense of Self Initiation:**

Ece talked about the questions in the problem. I asked *whether she wanted to see there (Hasankeyf)*. Her answer is given in the below quote:

E: Actually, I already wanted. A class organization may be done. I wanted to go and see there all together. It could be.

Moreover , when I asked her *whether this problem is important for her or not*. She gave the below answer:

E: It was important for me, but it was very good to see its importance again. For example, I wanted to see Hasankeyf. I didn't have this idea in my mind before. If I couldn't see now, there will be a big deficiency for me. I started to think what if the dam was constructed and I couldn't see there.

Sanem talked about the course activities and she made the below comment:

S: For instance, I sometimes see in myself. I pay attention to throw rubbish to seperated boxes if there are. I gained something in my self , what is it, yeah a habit.

Yeliz mostly talked about political side of the problem and she gave an advertisement example which is about a girl trying to save a lake and she takes part in a project. Her comment is presented as in below:

> Y: They started to save the lake together. Why not? I can do it, as well. Many hands make light work. Someones may be together with me.

As seen in the above statements, the need for autonomy of participants were supported. They wanted to take action to protect Hasamkeyf. Ece said that she wanted to see Hasankeyf. Sanem made general comments, but she said that she gained some sustainable behaviors which she initiated herself. Therefore, I can say that they felt more autonomous in this week.

- **Awareness about Environmental Actions:**

I asked participants whether their suggestions were taken serious during the course. Yeliz's answer is given in the below quote:

> Y: Yes. We all talked about wind power and solar energy. We thought that we can supply electricity from them. However ,does the total of these two energies supply the energy obtained from a dam? We asked this question to our instructor and she said that they are supplying so much. These may be constructed.

While Sanem talked about the problem, she made the below comments:

> S: We said that this area should be announced as a reservation area. When it was called as a reservation area, any people could not touch there. It could be protected by laws. In additon to history, the species will be protected, too. We think that media should be used if it is necessary to take a step. I heard this issue from the news.When we were talking together, we thought "Nature Sociey (Doğa Derneği)". They took people there (Hasankeyf) to increase their awareness and show an endangered place.

- **Real Life Connection:**

Ece talked about a friends of her from other groups who agreed with the dam construction on Hasankeyf. She explained what she thinks about this issue as in the below quote:

E: When we were realistic, we didn't see Hasankeyf. I didn't see there. I don't want its culture to be disappeared but I don't go and see there. Then, we think that what cashes on me but we shouldn't think like that. It is a bit realistic view. People need to live and need water to live. We think like that.

When I asked participants *whether the problem is important or not*, Sanem gave the below answer:

S: Indeed, it doesn't have any effect on me now because I didn't see there. Therefore, I am actually neutral. I was thinking like making no difference.

According to above statements, the problem was not so close to participants' real life therefore, their need for relatedness may not be fostered. However, in continious comments, focus group members said that they changed their mind and started to think Hasankeyf more.

- **Student Guided Discussion:**

I asked participants *what helped them while solving the problem*. Sanem gave the below answer:

S: I was not very much informed about this issue. I was knowing very few things. I learnt by combining the things which Yeliz, Ece, Muge and you said.

She also mentioned that she liked the discussion environment. Her comment is given in the below quote:

S: For me, the discussion was very exciting. (whole class discussion). We talked very much. A friend of other groups brought a different view. It was a nice environment.

Muge talked about the discussions and she explained what she learnt in her comment as in below:

M: For example, I liked the question asking what was the alternative. It was an original thing. The ideas were presented about this issue. This contributed something to me . I didn't know there were so much species diversity there. I learnt it from you.

- **Collective Construction of Ideas:**

Sanem talked about the questions in the problem and She explained what their last decision about the problem. Her comment is presented in the below quote:

S: The dam that will be constructed will provide energy for 50-80 years. We couldn't find the same place 50 years later. Therefore, we considered that this place in terms of history and species shouldn't be wasted for 50-80 years. This was the last decision we made.

Moreover, Yeliz explained their common decision about the problem. Her comment is presented in the below quote:

Y: We all together supported that the history of this place (Hasankeyf) should be protected. If the dam was constructed, people living there would have to leave their places so, we didn't want the dam to be constructed. If it is built, it may be built in another place instead of Hasankeyf.

During this week, participants collected each person's ideas and reached a solution. However, some of them said that they presented similar ideas and didn't express different opinions. For example, Ece made the below comment:

E: I said everything coming to my mind. However, I did not think very different things. We interestingly thought the same thing. Then, after one person realized, we thought the species extinction.

- **Consistent Group Dynamic:**

I asked participants *whether their suggestions were taken seriously by their group mates or not*. Ece's answer is given in the below quote:

E: There wasn't anytime when my suggestions were not considered. It is about a warm environment. We all say everything without hesitating.

Other participants also said that there weren't anytime when they weren't consideredby their group mates. They shared their ideas easily therefore, I can say that their need for relatedness were supported.

❖ **Focus Group Dicussions (audio recordings) and Assignments:**

During the discussions, they mainly focused on the outcomes of the problem and possible solutions. As seen in their interview responses, they said that Hasankeyf should be protected and alternative energy sources should be carried out. Their comments are presented in the below quotes:

FG: This area should be accepted as a reservation area. Firstly, if we conserve the historical places, then species living there will be conserved, too, because their environment is this place. Media also may be used to increase awareness of society.

FG: Dams shouldn't be removed because they are useful for people's demand. However, in terms of energy production, wind energy and solar energy should be used instead of dams because these energy sources don't have any negative effects on environment.

Assignments:

Focus group members investigated different subjects that I offered as an assignment in this course week and two codes as *Awareness of Personal role in the system and Real life connection* were emerged from their assignments. Their assignment subjects and their stattements in the assignments are presented below:

*Sanem*prepared water consumption and water trouble of some developed and developing countries and she suggested some solutions for water consumption. She emphasized water consumption of industries and agriculture and household consumption. She is aware of her role in this consumption. She presented some

solutions such as sustainable agriculture (less water usage), reducing and reusing of water in industrial areas, less population and less water demand. Sanem felt competent but, she didn't not give more solutions from her real life.

*Ece*investigated the harmful effect of excessive detergent consumption and she presented some solutions to reduce detergent consumption. She believed that it is possible to change our habits in detergent consumption. She is aware of her role in the consumption. She gave examples from her real life. For example, she wrote in her assignment as in below:

> E: There are some kinds of clothes. They don't need detergent to solve oily grimes. It requires more physical effort but it works efficiently as a detergent. We have this kind of cloth in our home. Carbonates can be used as bleacher. Still, sometimes I use it for my teeth. It can be used in other cleaning processes. Moreover, we can choose cleaners which include less phosphate and trichlorasan because trichlorasan in detergent react with chlorine in water and form chloroform which is toxic and in Turkey, such kind of detergents are sold.

Ece was aware of her role in the system and she presented solutions from her real life because she connected to problem to her real life.

*Yeliz*investigated water treatment in her town and suggested some actions to meet future needs.She is also aware of her role in the water consumption. She wrote in her assignment as in below:

> Y: We have to consider these issues all together. These are global warming, increasing in the population and unconscious population increase. First of all, we have to realize that earth has limited resources and we have to know how we should use these sources accurately. Secondly, global warming has a big impact on water crisis. So, we have to stop global warming effects as much as possible. Climate change cause decreasing in the amount of rain. Abnormalities in climates decrease the amount of rain, snow. Therefore, dams are not fully filled with water. It causes water crisis. As a result, people should prevent the effects of global warming as much as possible.

*Muge*also investigated water consumption patterns of some developed and developing countries and suggested solutions for sustainable use of water.She asked herself in the assignment; what should we do? What is the solution? While presenting her solutions, she was *aware of her personal role in the system*. She wrote in her assignment as in below:

> M: Beside the solutions for the agriculture, we can do something in our homes. For example, we can use biological processes to deal with the disposal and processing of human excrement into organic compost material. Composting toilets do not require water. We can do grey water recycling, wastewater generated from processes such as washing dishes, laundry and bathing and reused typically for irrigation. Also, we can do rainwater harvesting which is the collection and storage of rain from roofs or from a surface catchment for future use. The water is generally stored in rainwater tanks or directed into mechanisms which recharge ground water. We should use environmentally friendly laundry detergent and general cleaning soap made from soap nut berries. Detergents which are not containing phosphate should be used to prevent water from contamination. While brushing our teeth, we should close the tap not to waste water. In industry, water recycling techniques should be used. If we donot take the responsibility and give up our daily life habits, we will face serious and irreversible situations.

Muge also suggested solutions from her real life and I can say that she was aware of her personal role in this system.

The summary of the findings of course week 5 is presented in table 4.14.

Table 4.13 The frequencies of codes emerged from week 5.

Course Week 5	
The Codes	**Frequency of Codes**
Sense of Confidence in Action	0
Awareness of Personel Role in the System	3
Awareness about Environmental Actions	3
Sense of Self Initiation	4
Collective Construction of Ideas	3
Student Guided Discussion	3
Real Life Connection	2
Consistent Group Dynamic	1

As seen in PSTs' comments, their basic psychological needs were satisfied in this week. They presented their ideas easily and they collected their opinons and reach to one solution, but some of them stated that they couldn't present different opinions because their knowledge was equal for this issue. Moreover, some of them described the problem was not close to their real life. They explained that they have never seen Hasankeyf. Since the problem was far away from their real life, it was difficult to collectively construct the ideas. When the problem was close to their real life, their need for relatedness could be fostered and they could suggest solutions therefore, they could feel competent. They were aware of their role in both the reasons and the solutions of the problem. Moreover, they were aware of some environmental actions as alternatives to dams to protect the environment.

4.2.2.6 Summary of the findings for COURSE WEEK 6

The last problem given to PSTs was about solid waste problem in Mamak Garbage Dump. Sample excerpts of PSTs' interview responses, assignments and discussions were presented below.

- ❖ **Focus group interview responses:**

- • **Sense of confidence in action:**

I asked participants *what they liked most during the problem*. Ece's answer is presented in the below quote:

> E: As I didn't have very much information, I liked learning these things (the subjects discussed in the course). I learnt what is going on there. I could read something myself. I dont' know how projects work. A detailed research is necessary. However, they are going well, I can see from a large perspective.

- • **Awareness of personal role in the system:**

Sanem talked about the problem and her role in her in the problem. Her answer is given in the below quote:

> S: I realize that when I think something, I forget another thing. For instance, I am saying; lets' protect the soil. However, while protecting soil, we should consider living things there. All of them is in a chain and connected to eachother. Air is polluted, water is polluted and soil is polluted. You couldn't focus on one thing. You have to consider everything.

Yeliz talked about how people's awareness could be raised and she gave example from herself as in below:

> Y: We should teach this to new generation. There is a new coming generation and we will be teachers of them. We can teach environmental sensitivity to our students, our children begining from the first years and we can put recycling boxes for plastic, battery etc.. and hang on posters in our classrooms. Moreover, seminars informing families can be arranged.

- **Awareness about environmental actions:**

Ece explained *what they talked about during the discussions* and she mentioned that media may be used to increase people's awareness as in below:

> E: I think that media may be very effective. Media may invite popular people to diverse organizations and attract people's attention. I mean that it is more important to make people conscious. Not only this environmental course we take shouldn't be given to education faculty and also it should be given to other departments. Everybody should learn. Everything is based on habits.

Moreover she continued talking about this issue and she made the below comment:

> E: I realized that I don't pursue what a current thing and I don't know. I haven't known a project started in Mamak before. I learnt it when our friends who had information and I started to approach more consciously afterwards.

She learnt about the projects, some environmental actions and her awareness increased in the course. She believes that media and some environmental courses given to other departments may be effective to act for the environment. I can say that she felt competent because she said that she started to approach these issues more consciously.

- **Sense of self initiation:**

While Ece talked about the problem, she explained an action that she initiated in these weeks. Her explanation is given in the below quote:

> E: Our upstairs neighbor has some friends from parlement. A mayor secretary. I talked to him and I demanded the thing, container for plastic, paper... I consulted him about whether I should apply municipality or mukhtar's office. He said to me he can tell it and he told. They were back to me.

She applied to an authorized person to receive recycling containers which may be used in front of their apartment. She demonstrated an environmental behavior herself.

During the interview, Yeliz also mentioned about the similar action that she initiated in her apartment. Her explanation is presented in the below quote:

> Y: I hanged a statement in our apartments. For instance, I said that not to leave the electronic devices in plug. I wrote a statement including five or six items. I said to be a green apartment. I hanged it there so that we can be an environmentally senstive apartment. I said that people who protected the environment also protected his/her future. I said to be senstive, please. People who are coming or going to the apartment are reading it.

- **Student guided discussion:**

I asked participants *what helped them while solving the problem*. Ceyda gave the below answer:

> C: For example, I didn't know composting and I learnt it when we discussed in the class.

Morever she answered the question *whether the course activities were enjoyable or not* as in below:

> C: It was enjoyable. We are learning a new thing in each lesson. It is different and informative. I mean we like it

Nilay also explained that she liked the dicussions in the course as in below:

> N: It was nice to learn it (she is talking about zero waste). At least, hearing people's ideas. I liked discussion parts.

I asked participants *whether they felt like solving the problem is important or not*. Ece mentioned that she liked hearing different ideas as in below:

E: I liked the ideas that I could not think and our friends suggested. For example, I learnt the things that I hadn't known like composting thanks to these discussions. It was helpful for me.

- **Real life connection:**

Ceyda talked about *why the problem was important for her* and she made the below comment:

C: In Ankara, garbage containers were removed and a system was developed like that; at 9pm, everybody will go out their waste and it will be taken from there. However, this was not a clear solution. Therefore, garbage containers were put again. I investigated what they are trying to do and why this is like that, how a system they are developing. It attracted my attention when I read this (the Mamak problem) how the waste was collected and what processes were used. It was something that I wondered and read before.

Ece mentioned about people's habits in their daily life and she made the below comment about the problem:

E: Actually, I couldn't find a solution but, I believe that people are really unconscious. I said something on this issue in the course. We talked about Mamak garbage land but, we always say that a person should clean in front of his/her house and then the world will be cleaner. At first, people don't care about their living areas. We were in a very much trouble about this issue in our apartment.

Sanem explained *why the problem was important for her* and she made the below comment:

S: Of course, this problem should be solved. Even I like that fertilizing issue (she is talking about composting) very much. It was very difficult to find a natural fertilizer. This issue may be worked. Artifical fertilizer is sold but, I support natural fertilizer. The garbages that are collected from streets may generally contain organic wastes. A separated place may be constructed for these wastes.

All of the PSTs gave examples from their life and they connected the problem to their real life. They produced their own solutions and they felt competent.

- **Collective construction of ideas:**

I asked participants *whether their suggestions were taken seriously*. Yeliz's answer is given in the below quote:

> Y: We were all in an equal situation. We all had an idea. We tried to produce a solution.

Ceyda also mentioned *how they collectively constructed their ideas during the discussions* as in below:

> C: We all have ideas and we evaluate our ideas. When someone says something, another thing comes to other person's mind.

Moreover, Sanem explained that she learnt composting from her friends as in below:

> S: I didn't know composting. Both Yeliz and Muge talked about it. We said what it is and they explained it.

- **Consistent group dynamic:**

When I asked participants *whether there is anything they thought of contributing but didn't because they thought it was out of place.* Ceyda gave the below answer:

> C: No, nothing. If there is something like that, we all laugh. We say everything. Another things are talked after that.

Moreover, other participants mentioned that they could easily explain their ideas in the group.

They didn't hesitate sharing of their ideas because they felt relatedness in the group. This reason may be because of having a consistent group through the whole course weeks.

❖ **Focus group discussions (audio recordings) and assignments:**

• **Collective construction of ideas:**

PSTs tried to produce their own solutions to waste problem. They all presented different ideas and they constructed these ideas collectively. For example, they discussed about zero waste in the group as in below:

> S: I said that zero waste is not possible
> Y: There is human effect.
> E: Even if there is many solutions, it is not possible that everybody implements them. It is about habit.
> M: At least, it may be minimalized.
> E: Yeah, it may be.
> Y: If there is no human, human activity, zero waste is possible
> M: Yeah right
> Yeliz: But now there is human and we should produce solutions. We should increase recycling centers.
> E: But recycling is not the solution.
> Y: But, we should make recycling to reach the zero waste level or at least to minimalize
> Sanem: What else we should do?
> Yeliz: We should give importance to composting
> Sanem: Solid waste composting
> Yeliz: In the solid waste treatment centers, firstly recyclable materials are collected and then, other wastes are prepared for composting. They are used as fertilizer in parks and gardens.
> Ceyda: Is the solid waste as fertilizer?
> Yeliz: Yeah of course. Also, domestic wastes and faeces.

• **Real life connection:**

Moreover, they connected the problem into their real life. For instance, Yeliz made the below comment during the dicussions:

Y: Last day, my aunt came to us. She is an lawyer. I mentioned about recycling. She does not know it. I explained and explained, but she said that it is not seen as applicable.

The other group members said that it is all about education.

- **Sense of self initiation:**

Yeliz and Ece mentioned about what they will do or did about this waste issue as in below:

Y:I will write these issues and hang on our aparment wall.

E: We discussed all of them. My mother saw the woman who was throwing the waste and warned her.

Assignments:

PSTs investigated solid waste problem in their hometown in this course week. They focused on how solid wastes are collected and storaged and they presented their own solutions to the waste problems in their cities. They all were aware of their role in the system and they felf self initiated. Focus group members' explanations in their assignments are presented below:

Sanem pointed out changing people's daily life habits and she explained her solutions. For example, she wrote in her assignment as in below:

S: Take your cotton bag when you are going to supermarket. Reduce your packaging you consume by buying certain things in bulk. When making photocopies, go for doubled sided printing to reduce paper waste etc..

*Ece*combined what she learnt during the discussions of this course week in her assignment.She was aware of her role and she connected the problem to social groups. She believed that media may be effective to make people aware.

She mentioned about the issues that she discussed with her friends. Her explanation in her assignment is presented as in below:

> S: Education is necessary. People should store their wastes separately (plastics, papers, metals and households etc.). Municipalities should put some containers for them and people should get used to use them. When the amount of water decreased, every TV channel made a lot of advertisements about the usage of water. They said not to use water over enough. I think there may be a lot of advertisements about waste production. They can say; firslty, we should decrease consumption, secondly we should try to reuse and lastly, we should try to recycle. 3R is important and we should teach people its importance. I also learned that there is a process called composting. By this way, we can provide fertilizers from wastes.

Yeliz also examined waste management issue in her town. She was aware of her role in her assignment. She wrote:

> Y: We have to be careful while using something out of control. We can control the amount of waste and how they are collected. We have to change our daily life habits. Actually, there are a lot of solutions. For example, composting is a solution for reducing the amount of waste. By making composting, fertilizers are produced and agriculture gets benefit. Arrangements of school field trips to these facilities may increase awareness of students. By this way, they can be more careful to their environment and their waste production.

*Muge*presented applicable and effective solutions for the waste problem and she was aware of her role in these solutions and she connected the problem to her real life. She wrote in her assignment as in below:

> M: In my opinion that is the key point for this issue because before thinking about the waste management systems, it is better to think how we can reduce the waste that we produce every day. As an inhabitant of a big city, I am aware the seriousness of this big consumption craziness. As a result of this situation, people produce enormous size of wastes therefore;first of all, we

have to change our daily habits. Before recycling, we should reduce and reuse. We should buy the things that we really need, otherwise our consumption will increase, so our waste production will also become bigger and bigger. Also, we should prefer the materials that are not packaged so much, we should be careful about the packages because it is very hard to recycle these packages. We should use the materials in our homes for many purposes, not for only one purpose; also we should not use them for one time. For example we can use the milk bottles more than one time.

Ceyda was also aware of her role in the solution. She made the below explanations in her assignment:

> C: The most important solution is changing our habits. The first step is to separate recyclable things in our home. If it is performed in every home, it can change the direction of management of the solid wastes. This management will be easier for the municipality. Recyclable things will be sent into the recycling centers and the rest of them will be rearranged. The composting process can be increased because organic matters can be used as fertilizer with the help of this process. Briefly, each person must take their responsibility for this purpose.

All of the focus group members reported that they should change their daily habits. They gave their solutions from their real life. Muge was the one whose solutions were more based on real life and more effective.

All the assignments that were given to participants in each week were related to their real life. Because they were aware of their role in the solutions and they felt a part of the solution, I can say that their need for relatedness and competence were fostered in these course weeks.

The summary of the findings of the course week 6 is given in table 4.

Table 4.14 The frequencies of codes emerged from week 5.

Course Week 6	
The Codes	**Frequency of Codes**
Sense of Confidence in Action	1
Awareness of Personel Role in the System	9
Awareness about Environmental Actions	4
Sense of Self Initiation	2
Collective Construction of Ideas	5
Student Guided Discussion	4
Real Life Connection	4
Consistent Group Dynamic	1

As seen in above PSTs' excerpts, their basic psychological needs were fulfilled in the last week of the course activities. In this week, they started to initiate some pro-environmental behaviors. For instance, Ece started to take action in her environment in order to contribute to recycling. Besides, most of them mentioned that the problem was related to their real life; therefore, they found easier to discuss and suggest solutions to the problem. The codes and categories for each week problem are presented in table 4.16.

Table 4.15 The codes and categories with regard to each environmental problem (EP)

EP	Cognitive features				Instructional features			
	SCA	SSI	APR	AEA	CCI	SGD	RLC	CGD
Week1	0	3	7	4	8	4	2	0
Week2	0	4	5	0	4	2	3	1
Week3	2	5	8	3	6	3	2	0
Week4	1	0	1	1	0	4	3	0
Week5	0	4	3	3	3	3	2	1
Week6	1	2	9	4	5	4	4	1
Total	4	18	33	15	24	20	16	3

* SCA= Sense of confidence in action, SSI= Sense of self initiation, APR = Awareness of personal role, AEA= Awareness about environmental actions, CCI= Collective construction of ideas, SGD= Student guided discussion, RLC= Real life connection, CGD= Consistent group dynamic

According to table 4.8, the codes that were mostly emerged were awareness of personal role, sense of self initiation, awareness about environmental actions, collective construction of ideas, student guided discussion and real life connection. These codes are the evidences of supporting of basic psychological needs indicated that the three needs namely the need for competence, autonomy and relatedness of PSTs were fostered during the discussions. The summary of the codes and sample excerpts of PSTs are also presented in table 4.17.

Table 4.16 The codes and preservice science teachers' excerpts for each week

Codes	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
SCA			E:Actually, I would not believe to do sth as individual. I think many people do not take action because they do not believe but, after taking this course, I became more sensitive to my environment. I believed that I can do something so, when I confronted a problem like that, I can take step and I can try to do something.			E:As I didn't have very much information, I liked learning these things (the subjects discussed in the course). I learnt what is going on there. I could read myself. I dont' know how projects work. A detailed research is necessary. However, what works are going well, I can look at from a large perspective.
SSI	S: Actually, it was useful for me but, I can provide benefit for the environment by warning people in my community.	S: When I listened about how to make an action plan from guest speaker, I thought that we can make this kind of plan, a campaing. Some people may be responsible for this work and using cloth bag may be widespread everywhere. We dreamed it. This dream may be real.	S: First of all, we should examine the issue in detailed. Then, for example, as we are five people as group we can inform other people about this issue from class to school and we can make people aware about the issue. If everything is ok, we can apply to formal institutions. We can get help ofnon-govermental or ganizations like Doğa Derneği, Green peace etc and then we can apply to goverment institutions.		E: Actually, I already wanted. A class organization may be done. I wanted to go and see there all together. It could be.	E: Our upstairs neighbor has some friends from parlement. A mayor secretary. I talked to him and I demanded the thing, container for plastic, paper... I consulted him about whether I should apply municipality or mukhtar's office. He said to me he can tell it and he told. They were back to me.

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Table 4.16 continued

Codes	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
APR	E: Actually, we do not talk about this kind of serious things among friends but, I found that it is more useful to talk in the course to increase my awareness. You begin to be more careful. When you see that society applying these practices and give importance to them, you find the issues are more important	C: After this issue, I became more consicious. When I consume something, I am saying that I can use this one more and leaving it for reusing. I think I became aware even in one week.	M: This extinction problem worries me very much. I really more take attention it among other environmental issues.	E: We tried to think about the things causingCFC emissions.What could cause to its emissions. We tried to think the best way to reduce using of these devices (including CFC). We also thought that more countries should sign this protocol and it should be applied in more countries.	S: We started to be conscious after the course. Yeah, we started to gain awareness toward environment. Aftet that, I am thinking when I hear these issues. I try to make my own inferences so that would it be better if it is not like that.	S: I realize that when I think something, I forget another thing. For instance, I am saying; lets' protect the soil. However, while protecting soil, we should consider living things there. All of them is in a chain and connected to eachother. Air is polluted, water is polluted and soil is polluted. You couldn't focus on one thing. You have to consider everything.
AEA	Y: I thought what we can do. I thought that people should give their interests to this issue for a sustainable life. We talked about this with Sanem and Ece. International precautions are necessary. This sustainability concept should be common everywhere like some environmental organizations.	E: We were so much influenced by the presentation (guest speaker's presentation). When we heard about action plans that guest speaker explained, we wanted to make a plan. We had some plans and I hope they become real. I think we do something.	Y: Yes, we were interested in the things which guest speaker from Doğa Derneği (Nature Society) explained. Especially, we were very interested in that he graduated from math and became an expert in biology. I have not known how Doğa Derneği was effective before. I learnt about their works.	S: Can we change people's habits? We saw that we can change them by mean of this example you gave us. This is really performed.	Y: Yes. We all talked about wind power and solar energy. We thought that we can supply electricity from them. However ,does the total of these two energies supply the energy obtained from a dam? We asked this question to our instructor and she said that they are supplying so much. These may be constructed.	E: I realized that I don't pursue what a current thing and I don't know. I haven't known a project started in Mamak before. I learnt it when our friends who had information and I started to approach more consciously afterwards.

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Table 4.16 continued

Codes	Week 1	Week 2	Week3	Week4	Week 5	Week 6
SGD	M: We learn different opinions and there may be people who think differently. I mean that thiskind of socializing in the class is more enjoyable and useful	C: I really liked the last evaluations in the course. This week we said a different thing from other groups. Everbody prefered the paper. There may be differences. We are learning the things we don't know. Sharing ideas at the end of the course are effective and I liked most this part.	E: That everybody has an idea and a suggestion in this course is nice. It is beatiful to hear other group friends' ideas. It is good to see that other friends know something which I couldn't think or my group friends couldn't. I like everybody knows something and they have an idea. I like sharing ideas.	E: I liked class discussions.I really learn the things I didn't know before.	S: For me, the discussion was very exciting. (whole class discussion).We talked very much. A friend of other groups brought a different view. It was a nice environment.	C: For example, I didn'tknowcomposting and I learnt it when we discussed in the class.
CCI	S: Studying with friends is very effective. Someone may explain the thing that I did not know and we complete eachother in this way.	Y: We found a common solution. We said that we do not use both of them or we use them in a minumum level. We said that we should increase using of cloth bag. We agree of this idea.	E: Yes, Actually, we make brainstorming. An idea that does not come into one's mind comes to another person's mind and then, they are collected.		Y:We all together supported that the history of this place (Hasankeyf) should be protected. If the dam was constructed, people living there would have to leave their places so, we didn't want the dam to be constructed. If it is built, it may be built in another place instead of Hasankeyf.	C: We all have ideas and we evaluate our ideas.When someone sayssomething,another thing comes to other person's mind.

Table 4.16 Continued

Codes	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6
RLC	S: It was combined to real life. It leaded us to compare past and today and increased our awareness.	C: Actually, it is from causal life. We always consume and waste. There are many recycling bins in the dormitory. Generally, we do not see recycling bins in other places. I sometimes do shopping and when I return home, I am thinking what I will do with these things. Since we always live these kind of things, we contributed.	M: I like these kind of cases. I support case studies in the course. Especially, these cases are from real life and so, they are nice because they leaded people to make brainstorming. Therefore, I like this course.	S: Indeed, it has so much effect in our daily life. For example, that a relative of mine becomes skin cancer may direct people on this issue. Why it may be? Of course, there are other factors. There are many cosmetics. This issues may come into people's mind.	S: Indeed, it doesn't have any effect on me now because I didn't see there. Therefore, I am actually neutral. I was thinking like it makes no difference.	S: Of course, this problem should be solved. Even I like that fertilizing issue (she is talking about composting) very much. It was ver difficult to find a natural fertilizer. This issue may be worked. Artifical fertilizer is sold but, I support natural fertilizer. The garbages that are collected from streets may generally contain organic wastes. A separetad place may be constructed for these wastes.
CGD		E: I do not hesitate saying of my ideas in the group because we are in a friends' group. I know that people will not mock with me.			E: There wasn't anytime when my suggestions were not considered. It is about a warm environment. We all say everything without hesitating.	C: No, nothing. If there is something like that, we all laugh. We say everything. Another things can be passed after that.

4.2.3 Reflections of PSTs about The Final Project:

At the end of the semester, each group in the class prepared their project related to specific environmental problems. Focus group members investigated organic and non- organic food consumption in their university campus. Firstly, they determined their problem that is "there is non-organic food consumption in the campus". Then, they discussed what may be the reasons of the non-organic food consumption in the campus and they presented the possible reasons of this problem. After they explained their reasons, they determined what may be done to reduce non-organic food consumption in the campus. In other words, they determined the possible environmental actions which may be effective to solve the problem. Lastly, they explained what they wanted to aim in terms of solving of the problem.

To put it differently, this project allowed PSTs to use what they learnt during the problem-solving activities in the course and thus, they caught an opportunity to produce their personal solutions to perform the project. At the end of the project, each group member evaluated their project through a whole system rubric which was given them by the researcher and following the evaluation, they wrote a reflection paper about their project. Focus group members selected the C column in the rubric which was given in appendix D. What PSTs wrote in their reflection papers is presented in this part of the results.

PSTs wrote their reflection paper in terms of the following questions. In this way, I again investigated how their basic psychological needs were supported or not. The questions in the reflection paper are presented below:

1. Please, write your explanation. Why did you choose that column?

2. What you learned preparing this project? In other words, how this project contributed to you?

3. What helped you while preparing the project? Please, explain.

4. Did you feel you could effectively contribute the project? Why or why not? Please, explain.

5. Did you feel like your suggestions were taken seriously by your group mates? Why or why not? Please, explain.

6. Do you think that your project may help improve the environmental problem in terms of your topic and how it may help or not? Please, explain.

Some codes supporting basic psychological needs were emerged from PSTs' reflection papers. These are *awareness of personal role in the system, sense of confidence in action, consistent group dynamic, collective construction of ideas.*

- **Awareness of personal role in the system:**

In the reflection papers, focus group members stated that they were aware of their role in the system. Sample excerpts of participants are presented below:

> E: We chose this column because we believe that we are aware of the importance of the issue. This awareness lets us to make decisions easily, take actions and work together beneficially although we are all different people.

> S: Because I think that it is the best-rounded column. At the end of the project, I can say that we made choices and decisions and took actions that benefit for the health of the campus. I know that these actions will be beneficial. I know how to participate in a functioning team that represents different perspectives.

> M: I chose that column (C) at the end of the project. I saw that I can make choices and decisions and take actions that benefit the health of the whole system in which the parts are dependent on each other.

Through the preparing this project, PSTs perceived their own role in the system and they felt competent while finding solutions to the problem. They also felt autonomous because they made their own choices and decisions. Moreover, as Ece and Sanem said that they learned working in a team in which each people have different ideas.

- **Sense of confidence in action:**

All of the focus group members felt confident in their actions. They believed that their actions (their solutions) may be useful for the environment. Sample excerpts of participants are given below:

> E: I think our project was appropriate. We didn't write any action which is difficult to carry out. Therefore, in my opinion, these actions will have positive effects on environment if they come to be real. I mean that our actions will bring effective solutions to the problem in our project.

> M: In my opinion, our project can help this problem because our actions are very effective. If we conduct all our actions in time period we offered, I believe that organic food consumption will increase in the campus.

> S: I think that our project may help improve the environment in terms of our topic. If our actions are taken serious by responsible people, they can easily be applied in our campus because they are not difficult actions to be applied. The most important thing is to take action.

PSTs felt confident in taking action with regard to their environmental problem and they believed that their actions may be effective; therefore, they felt competent. Nevertheless, they said that they need other people' support to carry out these actions. In other words, their need for relatedness should be supported in order to act for the environment.

- **Collective construction of ideas:**

As PSTs made a group work, they collected each groups' ideas and produced their solutions. Some of the participants mentioned about this issue. Sample excerpts are given below:

> S: Having different perspectives in our group helped us produce solutions more and more. I know that these perspectives enable us to recognize interdependence in the systems.

> Y: As a group, we made effective contributions. Every group member had different thinking style and this help us get more ideas for the project.

> M: The discussion which we did at the preparation process of the project, were very beneficial. Sharing ideas with my group friends were enjoyable.

They liked learning different ideas, comments during the discussions. These discussions helped them produce different solutions. I can say that while preparing the project, their need for relatedness and competence were fulfilled.

- **Consistent group dynamic**

PSTs explained that working in a group helped their learning. Through the whole semester, they worked with the same group; therefore, they felt comfortable making the project with the same group. Sample excerpts of participants are given below:

> M: The discussions we made in the preparation period of this project were very beneficial. It was enjoyable to share opinions with my group members.

> E: I learned working in a group as a person, how to tolerate some excuses in a group and how to evaluate different point of views.

Moreover, they stated that they felt competent through the all process of the project. For example, some of them said:

> S: Yes, I contributed to the problem effectively because I placed in every stage of the problem. Also, I had knowledge about GMO (genetically modified organisms) from newspaper, TV and internet because it is a very popular issue these days. I shared my knowledge with my friends.

> M: I felt that I contributed effectively to the project. I made effective interpretations while discussing our actions, agents and goals. For example, I encouraged my friends to discuss about constructing organic food stand in the spring festival.

Finally, PSTs were asked about their future plans with regard to environmental issues after the whole activities, assignments and projects finished. The questions which were asked them to evaluate the course activities are presented below:

1. What changes do you think you have made in your pro-environmental actions while and after taking the course? Please, explain. Think about the problems, assignments, projects in the course.
2. Do you think that you will maintain your pro-environmental behaviors in the future and do you have any plans related to this issue? Could you explain why you want to maintain your environmental behaviors in the future? Please, explain.
3. Do you want to be a volunteer for any environmental project? What kind of projects do you want to participate? Please explain. If you have already volunteered of a project, please explain it.

Regarding these questions, I want to present the answers of focus group members.

M: I am showing some behaviors more frequently in my daily life. For instance, I always pay attention to turn off the lights.

C: I am more aware of the environmental problems after this course. I pay more attention to my behaviors such water consumption, recycling, consumption of natural products. I use less paper and less plastic and after I use them, I am making recycling. Moreover, I inform my family and my friends about environmental issues.

S: I have a plan. I will suggestthe mayor of my town to start recycling process in our town. Thus, we will have a cleaner environment. I want to maintain my environmental behaviors because I am aware of environmental problems and issues around us. For our life and nature, these behaviors are necessary.

E: I want to maintain my behaviors because we should think our nature. If we use natural sources unconsciously and harm to our natural environment, next generations will have difficulty to live.

M: To increase environmental awareness and decrease the environmental pollution, we should take important steps on this issue and maintainthem. I

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especially want elementary school students to internalize this issue and plan some projects to make them real because pro-environmental behaviors and habits may be gained in these years.

In conclusion, during the course activities, PSTs' three basic psychological needs were supported and their self-determined motivation toward environment was fostered. Moreover, they started to apply some pro-environmental behaviors in their life yet; the important point is whether they will continue showing these behaviors or not. As they indicate long term pro-environmental behaviors, their pro-environmental behaviors should be self-determined; therefore, more research is necessary to investigate this issue deeply.

CHAPTER 5

DISCUSSION

In this last chapter, discussions of the present study and implications toward science education and environmental education and recommendations for further researches are presented.

5.1 Discussions

The present study aimed to investigate PSTs' self determined motivation toward environment and understand how their basic psychological needs that support their self determined motivation were fullfilled or not during the course activities. For this purpose, participants engaged in the discussions including environmental problem solving and prepared assignments and a project about environmental problems through the environmental course. Within a survey method, their motivation toward environment was measured before, after and five months later following the course. Moreover, how their basic psychological needs were supported was examined through multiple case study.

Descriptive findings of the quantitative part of the study revealed that pre-service science teachers' self determined motivation (intrinsic motivation and integrated regulation) toward environment increased during the course activities. More specfically, descriptive statistics showed that PST's intrinsic motivation increased after the course activities and even if it decreased five months later following the course, it was still higher than their intrinsic motivation before the course. Inferential statistics also supported this finding indicating a statistically significant difference on intrinsic motivation scores before and after the course activities and also before and five months later following the course. Intrinsic motivation refers to self interest and intrinsically motivated behaviors are derived from self not from an external force (Deci & Ryan, 2004). Hence, this finding implied that, as a result of the course activities, PSTs may feel the pleasure while engaging in pro-environmental behaviors

to improve the quality of the environment and help the environment (Pelletier, et al., 1998). Indeed, these are the intrinsic reasons why people show pro-environmental behaviors. To be more specific, intrinscially motivated individuals engage in environmentally responsible behaviors because they are volunteer to take action and want to protect the environment not for instrumental reasons (obtaining rewards or avoiding to feel guilt) (Pelletier, et al., 1998) but for intrinsic reasons. Overall, the results of the present study indicated that PSTs may have gained internalized environmentally responsible behaviors after the course activities. How they may have gained internalized environmentally responsible behaviors was investigated through qualitative study. One of the important reasons to improve intrinsic motivation toward environment is to feel competent or believe to be capable (De Young, 2000). Qualitative results supported this finding. PSTs realized their role in the problems and they believed that they can help the environment. For instance, Ceyda said in the second week (Paper vs Plastic) "After this issue, I became more conscious. When I consume something, I am saying that I can use this one more and keeping it for reusing. I think I became aware even in one week". Moreover, Muge wrote in her reflection paper about the project: " I chose that column at the end of the project. I saw that I can make choices and decisions and take actions that benefit the health of the whole system in which the parts are dependent on each other". They believed themselves to take action and felt more competent to help the environment during the course.

Integrated regulation which is another type of self- determined motivation also raised after the course activities and remained the same five months later. Integrated regulation which is similar to intrinsic motivation occurs when a behavior is integrated to the person's self definition (Pelletier, et al., 1998). People who have integrated regulation toward environment believe that helping the environment is an integral part of their life or a part of the way of their life (Pelletier, et al., 1998). In the present study, PSTs' integrated regulation increased after the course activities and remained the same following the course yet, this result was not statistically significant.

In addition, descriptive statistics revealed that identified regulation decreased after the course activities and five months later following the course. Deci and Ryan (2004) accepts identified regulation as more close to self determined motivation because it is an internalized form of extrinsic motivation. People show the behaviors which are regulated through identification for personel values or goals. Comparing to external motivation and introjected regulation, it is more self determined form of extrinsic motivation (Deci & Ryan, 2004). In the present study, identified regulation decreased after the course activities even though the results were not statistically significant.

 In the same manner, according to descriptive statistics, PSTs' introjected regulation decreased after and five months later following the course activities. Introjected regulation is another type of extrinsic motivation since people show the behaviors which are introjectedly regulated not to feel guilt or shame (Deci & Ryan, 1990). Introjectedly regulated behaviors are controlled by internal factors (internal coercion) and therefore, they are accepted as nonself-determined. Moreover, people who engage in behaviors which are introjectedly regulated lose intrinsic motivation for the main behavior (Deci & Ryan, 2004). Even if there was an increase in PSTs' external regulation and their amotivation after the course activities and again a decrease five months later. External regulation was the opposite type of intrinsic motivation. Individuals show externally regulated behaviors to foster an external demand which may be receiving a reward or avoding a punishment (Deci & Ryan, 1991; Deci & Ryan, 2004). As it is not internalized regulation, it is accepted as a nonself-determined motivation type. Moreover, amotivation means the lack of motivation. Amotivated people do not take action or take passive actions because they don't value the actions or they have lack of perceived competence to act (Ryan, 1995; Bandura, 1977). Declining of these motivation types (introjected regulation, external regulation and amotivation) is important to develop self determined pro-environmental behaviors since self determined individuals are dissatisfied with the environmental problems and they are more willing to act for the environment and they feel more competent to be active for preserving the environment (Pelletier, et al., 1998). On the other hand, non-self determined individuals are satisfied with the

current situation of the environment and they don't want to act to solve the environmental problems (Pelletier, et al., 1998). Even if the results were not statistically significant, PST's non-self determined motivation (introjected regulation, external regulation and amotivation) decreased five months later following the course. In summary, it is crucial to develop self determined motivation and pro-environmental actions in the environmental education classrooms. People who have self determined motivation toward environment show more difficult pro-environmental behaviors. For instance, a lower level of self determination may be sufficient to recycle at home whereas more self determination is required for a person who lives away from recycling bins to contribute recycling (Pelletier, et al., 1998).

In the present study, the reasons of PSTs' amotivation toward environment or environmental amotivation was examined through administration of Amotivation toward Environment (AMTES) scale developed by Pelletier et al. (1999). There were four proposed reasons (subscales) contributing to amotivation toward environment in the AMTES. One of the proposed reasons was helplessness beliefs which; refer to individual's belief that their contribution may not be effective to protect the environment. Another reason is negative effort beliefs which mean that individuals don't perceive their efforts as useful and they don't want to make any effort for the environment. Finally, effort beliefs are related to self efficacy or sense of self confidence because individuals who have lower self efficacy to act, they diminish their effort and give up (Pelletier, et al., 1999). In the present study, PST's amotivation because of effort beliefs and helplessness beliefs were found to increase after the course activities and decrease five months later following the course; however, the results were not statistically significant.

On the other hand, qualitative results indicated that PSTs' negative effort beliefs decreased through the course. At the begining of the environmental problems (in the early weeks), PSTs stated that they didn't believe that their efforts were effective for solving the environmental problems. For instance, Ceyda said: "I try to contribute to recycling. I seperate papers and plastics but I think it is not enough because many people don't contribute recycling and I think it doesn't work. Whatever I do

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something, I don't think there will be a progress". Actually, she is not satisfied with the current situation and she made an effort to protect the environment yet, she found that her effort is useless; therefore, her sense of confidence in taking action was low and she felt helpless. Through the course weeks, they started to believe that they may change the current situation. For example, Sanem said in the fifth week (Hasankeyf): "We started to be conscious after the course. Yeah, we started to gain awareness toward environment. Aftet that, I am thinking when I hear these issues. I try to make my own inferences so that would it be better what if it is not like that.".

The other reasons leading to amotivation are strategy and capacity beliefs. Strategy beliefs refer to expecting that certain strategies are not effective to produce outcomes (Pelletier, et al., 1999). In environmental psyhchology context, individuals who are amotivated because of strategy beliefs don't believe that environmental programs are effective to solve the problems. This belief declined after the course activities and raised again yet, this was not a significant result. Through the course, PSTs mentioned about environmental programs, organizations and actions with regard to problem sets. Their awareness about these environmental actions increased in these weeks. For instance, Ece commented about this issue in the second week. "We were so much influenced from the presentation (guest speaker's presentation). When we heard about the action plans that guest speaker explained, we wanted to make a plan. We had some plans and I hope they become real. I think we will do something". When environmental organizations and people who are interested in environmental issues provide individuals the information about how to act for the environment, their environmental awareness and need for competence increase. Thus, they don't feel amotivated (Pelletier, et al., 1999). PSTs felt competent when they learn about environmental actions in detail. Therefore, I can say that they didn't feel amotivated because of strategy beliefs and they believed that environmental strategies may be effective to protect the environment.

Finally, amotivation because of capacity beliefs declined after the course activities and in follow up measurement. This finding was found as statistically significant. Bandura (1977)proposed the concept of self efficacy expectancy which means

"people's beliefs in their capacity to perform a certain behavior". This concept includes capacity beliefs. If people do not believe their capacity to perform a task successfully, they feel amotivated (Pelletier, et al., 1999). In environmental psychology context, people who have negative effort beliefs may believe that they couldn't make any effort to change their habits or make necessary sacrifices Moreover, people who perceive that they are competent, they believe that they have the capacity to perform an action (Pelletier, et al., 1999). Hence, when their need for competence was supported, they feel motivated toward environment (Pelletier, 2004). During the course activities, PSTs' need for competence was fullfilled. For instance, in the first two weeks of the course, the code of sense of confidence in action was not emerged from focus group participants' comments but this code was determined in other weeks. They started to believe their capacity to act for the environment and they felt confident in taking action so, their need for competence was satisfied and thus they didn't feel helpless. For example, the comment of Ece summarizes this situation in the third week of the course: "Actually, I would not believe to do something as individual. I think many people do not take action because they do not believe but after taking this course, I became more sensitive to my environment. I believed that I can do something so, when I confronted a problem like that, I can take step and I can try to do something".

Qualitative results of this study revealed that supporting cognitive and instructional features of PSTs during the course activities fullfilled their basic psychological needs and thus, fostered their self determined motivation. The codes emerged from PSTs' comments were *sense of confidence in action*, *sense of self initiation*, *awareness of personel role in the system* and *awareness about environmental actions*. These codes were categorized as cognitive features. The other codes which were categorized as instructional features are *collective construction of idea*s, *student guided discussion, real life connection and consistent group dynamic.* These codes were the evidences explaining whether PSTs' basic psychological needs were supported or not during the discussions. Nevertheless, as these codes or features were related to focus group members' comments in the discussions, it is essential to conduct further research to

display how these features may contribute to satisfaction of PSTs' basic psychological needs.

Sense of confidence in action was not emerged in the early two weeks of the course. In the first weeks, PSTs have believed that they couldn't change the current situation and they felt helpless. Deci and Ryan (2004) reported that sense of competence is related to sense of confidence and effectance in action. Regarding this definition, I can say that feeling confident while solving the problems in the course supported PSTs' need for competence and their self determined motivation toward environment. For example, Sanem said in the third week: "I do not think that I can be effective on my own so, I could not handle but if I can increase awareness of people in my community and I can gain their support, I can overcome it". Actually, Sanem needed other people's support to act for the environment. That is, her sense of relatedness should be supported in order to feel competent. Darner (2007) expressed that there is a positive relationship between sense of relatedness and competence. If individuals' need for relatedness was fullfilled, their sense of competence was also fostered. At the last three weeks of the course, basic psychological needs of PSTs were measured by daily need satisfaction scale developed by Laguardia, et al. (2000). The quantitative findings of this measurement revealed that there was a positive relationship between need for competence and relatedness. Palmerg and Kuru (2000) pointed out that interaction with environment and experiences in nature satisfiy students' sense of confidence and they feel more willingness to engage in future outdoor activities. To be more specifically, as students' sense of confidence which also refers to need for competence was supported, their motivation to participate in the actions increased.

Sense of self initiation which contributes to satisfaction of autonomy need was supported during the discussions. Self initiated behavior is derived from self not an external force (Howy, 2007). Moreover, sense of self initiation supports the need for autonomy and thus, promotes internalization and self determination (Grolnick & Ryan, 1989). Autonomous people engage in the activities more willingly and became more intrinsically motivated (Niemic & Ryan, 2009).That is; when people have

higher autonomous motivation toward environment, they display more pro-environmental behaviors than people who have more controlled motivation (Green-Demers, et al., 1997).Deci & Ryan (2004, p.8) reported that when individual's behavior is derived from self rather than outside factors, they feel more initiative. During the discussions, PSTs stated that they wanted to initiate some actions for the environment. For instance, Ece said in the third week (the problem; Why worry about extinction): "I would start to organize my closest friends and we would take action. Union gives strength. You could not do so much things as an individual because it is difficult to overcome companies. We should do something to make people aware. We can make an organization". The code of sense of self initiation was emerged in the first week and continued to be appeared in other weeks excluding the fourth week. During the discussions, PSTs made their own decisions via constructing different ideas in the group. They learned from eachother. I only guided them not leading to their discussions. Therefore, they felt more autonomous during the course activities.

Another codes emerged from focus group members' comments is *awareness of personal role in the system* and *awareness about environmental actions*. When individuals are provided environmental knowledge and skills about specific environmental behaviors and how to carry out these behaviors, their awareness of environmental problems increased and their need for competence was fullfilled. Hence, their amotivation toward environment reduced (Pelletier, et al., 1999). During the discussions, PSTs realized their role while solving the problems and they touched this issue in each week of the course activities. Moreover, they expressed that their awareness about envrironmental actions raised during the course activities. This code was appeared in each week excluding the second week. For example, Sanem expressed her personal role and she combined the problem to the current problems in the first week (the problem; Easter Island). She said; "Actually, thanks to this case, we saw a concrete example that is happening in our environment but we are not aware of it. After we read the case, we thought that this kind of things are happening today, too and we may live the same situation in the future". When they realize their personal role, they may feel competent. Nevertheless, only feeling competent is not

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sufficient to foster intrinsic motivation or self-determined motivation; therefore, they also should feel autonomous (Deci, et al., 1991). There is a correlation betweeen the need for competence and autonomy. This finding was exlplored in PSTs' comments. For instance, Sanem said in the first week (the problem, Environment vs Economy); "It was nice to know something from my life in this case. Actually I was aware and I could warn people in my community". Moreover she said;" Actually, it was useful for me. I can provide benefit for the environment by warning people in my community". Firstly, her awareness about her personal role increased and she felt competent. Later, her sense of self initiation was fostered and she felt autonomous. Therefore, she wanted to warn people in her community about the environmental situation. When individuals are aware of their internal conditions, feelings, values and desire, they can make their own decisions and choices (Ryan & Deci, 2008). In other words, so as to self initiate a behavior or an action, individuals should be aware of their current situation. Also, they start to decide what is better for the environment. That is to say they can perform self determined behaviors for the environment (Darner, 2007). The comments of Ece and Sanem are good examples supporting this situation. Firstly, Ece said in the fifth week (Hasankeyf); "We tried to think about species there. We thought that species will be extinct. Actually, protecting the history of Hasankeyf provides protecting species because construting of a dam means completely changing lifestyle. I mean that a bird may not live there. It leaves there and looks for a new place because we changed this place. Moreover, according to case, dams are built for fifty years. Water need will not finish after fifty years. The need for dams will not finish. Therefore, there will be destruction in another places. More long lasting solutions are necessary". She critically explained the situation in Hasankeyf and she expressed that more long term solutions are essential to protect Hasankeyf. Moreover, Sanem made a better explanation by saying; "We started to be conscious after the course. Yeah, we started to gain awareness toward environment. Aftet that, I am thinking when I hear these issues. I try to make my own inferences so that would it be better what if it is not like that". Briefly, after they realized their personal role in the problems, they began to consider what they can do for the environment or what actions may be better to protect the environment.

In this manner, their need for competence and autonomy were fostered during the group discussions.

*Awareness about environmental action*s appeared in almost all course weeks including environmental problem solving. Pelletier (2004) examined how goverment approaches regarding environmental programs and strategies and behaviors of others in the close environment influence satisfaction of basic psyhcological needs and self determined motivation. In the present study, PSTs talked about environmental organizations, programs, other people's behaviors and actions in their environment. They underlined that their awareness about environmental actions raised during the discussions. For example, Ece expressed this situation in the sixth week (the problem; Mamak Garbage Dump) by saying: " I realized that I don't pursue what a current thing and I don't know. I haven't known a project started in Mamak before. I learnt about it from our friends who had information and I started to approach more consciously afterwards". Furthermore, when individuals perceive that people around them are concerned about the environmental issues and care about the the problems, their amotivation toward environment may reduce (Pelletier, 2004; Pelletier, et al., 1999). For instance, Ece said in her interview in the third week; "Actually until this time, I was not aware of these kind of things. I did not make any research about them. I always hear about Green Peace, Nature Society (a non-govermental organization), but I have never searched or listened their works. I firstly listened our guest speaker who talked about Nature Society. I will read and search about them after that. Until this time I am not interested in them. Now, I know about them and I will easily understand what I read and I can be more positive after that". She talked about some environmental organizations and she expressed that her awareness about these organizations increased. Hence, her sense of competence and relatedness were supported. Nevertheless, increasing awareness of people is not sufficient to foster self determined motivation and self determined pro-environmental behaviors (Pelletier, et al., 1999). Nonetheless, once individuals believe that some environmental actions are effective to solve the environmental problems, their need for relatedness and competence may be supported.

In the above statements, I mentioned about some cognitive features affecting PSTs' basic psychological needs directly and their self determined motivation indirectly. Furthermore, some instructional features affecting basic psychological needs of PSTs were found in the data. Once both of these features are activited in the course, PSTs' basic psychological needs are satisfied and they feel self determined motivation toward environment.

Real life connection is one of the instructional features which were discovered during the course activities. All of the environmental problems which were given during the course were connected to PSTs' real life. Most of the focus group members expressed that the problems are connetected to their daily life and help their learning. This code was emerged in each course week including environmental problems. For example, Ceyda mentioned about this connection by saying; "In Ankara, garbage containers were removed and a system was developed like that; at 9 pm, everybody would get out their waste and these wastes would be taken from there. However, this was not a clear solution. Therefore, garbage containers were put again. I investigated what they are trying to do and why this is like that, how a system they are developing. It attracted my attention when I read this (the Mamak problem) how the waste was collected and what processes were used. It was something that I wondered and read before". When the problems are close to their real life, they feel a part of the solution and produce more effective solutions and feel competent. In addition, PSTs gave examples and solutions for the problems from their daily life in their assignments. When real life examples are given to students, they feel more motivated to take action for solving the environmental problems (Unal, 2008). However, in the fifth week including Hasankeyf problem, some of the focus group members stated that they didn't find the problem close to their real life because they didn't see Hasankeyf before and therefore, the problem didn't affect them so much. Nevertheless, in their continous comments, they displayed that they felt more connected to the problem. Once individuals see a connection between the problem and their real life situations, they start to think about positive actions to protect the environment in their daily life and they feel self determined toward pro-environmental behaviors (Darner, 2007).

Another instructional features which was emerged from PSTs' comments are *collective construction of ideas*, student guided discussion and consistent group dynamic. These factos supported PSTs' need for autonomy and relatedness. During the course activities, firstly, group discussion were conducted and whole class discussion followed it. PSTs worked with the same group throught the six course weeks and performed their project with the same group. Collective construction of ideas and student guided discussion occured in almost each week yet, consistent group dynamic was rarely apparent. During the discussions, they collectively constructed the ideas and suggested solutions to the problem. For example, Sanem said in the first week: "Studying with friends is very effective. Someone may explain the thing that I did not know and we complete eachother in this way". Ece also said in the third week; "Yes, actually, we make brainstorming. An idea that does not come into one's mind comes to another person's mind and then, they are collected". Each person helped devise the solutions of the problems collectively. Darner (2007) pointed out that collectively construction of ideas satisfied indiviuals' basic psychological needs. More specifically, their need for autonomy was fullfilled since they make their own decisions or choices and learn from eachother. Also, individuals' need for relatedness is satisfied as they work in a group in which a learning community and collaboration are built through a group problem solving activity (Claxton, 2002 as cited in Darner, 2007).With a group problem solving, a zone of proximal development is established and students develop a scientific understanding and thus, their need for competence is satisfied (Lemke, 2002 as cited in Darner, 2007; Vygotsky, 1978).

In addittion to collective construction of ideas; *student guided discussion* and *consistent group dynamic* also fostered PSTs' basic psychological needs. PSTs commented that they liked the discussions at the end of the course because they helped their learning. For instance, Sanem said in the fifth week: "For me, the discussion was very exciting. (whole class discussion). We talked very much. A friend of other groups brought a different view. It was a nice environment". Ceyda also expressed the effectiveness of class discussions by saying: "I really liked the last

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evaluations in the course. This week, we said a different thing from other groups. Everbody prefered the paper. There may be differences. We are learning the things we don't know. Sharing ideas at the end of the course were effective and I liked mostly this part". Darner (2007) reported that student guided lecture support students' need for autonomy since the information mostly is derived from students not the instructor. In the present study, PSTs' need for autonomy and also competence were fullfilled because they stated that they liked sharing ideas and making effective contributions. Moreover, PSTs said that they are always open to sharing in the group discussions. Ece described this situation in the fifth week: "There wasn't anytime when my suggestions were not considered. It is about a warm environment. We all say everything without hesitating". Working in the same group throught the whole course support participants' basic psychological needs (Darner, 2007). I inferred that as focus group members studied with the same group, they didn't hesitate explaining their ideas and comments explicitly and their need for relatedness was more likely satisfied. Moreover, in the fifth week (Hasankeyf), PSTs' basic psychological needs were measured and found that there was a strong positive relationship between the need for competence and relatedness. Qualitative data also supported this finding. As they collectively constructed ideas, their learnt different things and they considered that they made effective contributions. This finding was more certain in the reflection papers. For example, Yeliz said in her reflection paper which is about the final project: "As a group, we made effective contributions. Every group member had different thinking style and this helps us get more ideas for the project". Sanem also said similar things: "Having different perspectives in our group helped us produce solutions more and more. I know that these perspectives enable us to recognize interdependence in the systems". Constructing this final projectallows students decide what is better for the environment and produce effective solutions and thus, their need for autonomy is supported (Darner, 2007). Moreover, students understand that human is also a part of the ecosystem and their need for competence is fulfilled (Darner, 2007). The comments of PSTs in their reflection papers supported these findings. For instance, Müge said: "I chose that column at the end of the project. I saw that I can make choices and decisions and take actions that benefit the health of the whole system in

which the parts are dependent on each other". Moreover, she believed that they made effective suggestions: "In my opinion, our final project can help this problem because our actions are very effective. If we conduct all our actions in time period we offered, I believe that organic food consumption will increase in the campus". In conclusion, preparing the project in which they proposed their own solutions r actions for an environmental problem satisfied PSTs' basic psychological needs and they believed that they can produce effective solutions for the environment and be a part of the solution. Hence, their self-determined motivation was fostered.

Lastly, I examined whether there is a relationship between self-determined motivation and basic psychological needs that were supported during the course activities. Even if relatedness and autonomy were positively correlated with intrinsic motivation and integrated regulation, this result was found as non-statistically significant. Darner (2007) found that relatedness positively predicted self-determined motivation toward environment whereas autonomy negatively predicted it. Nevertheless, she discovered that there is a positive relationship between three basic psychological needs. In the present study, the reason of not finding statistically significant result may be because of small sample size. Therefore, this study may be replicated with a larger sample size.

In summary, the results of the present study pointed out that when PSTs' three basic psychological needs were satisfied during the course activities, their self-determined motivation was fostered and their amotivation toward environment was undermined. The results of this study were also consistent with the relevant literature (Darner, 2007; Pelletier, et al., 1998; Pelletier, et al., 1999). In order to develop self-determined behaviors which are derived from self (Deci & Ryan, 1991) and promote longer and more frequent pro-environmental behaviors, it is required to foster self-determined motivation and support basic psychological needs in environmental education classrooms.

5.2. Implications and Recommendations

Regarding findings of the present study, I will present some implications and recommendations that should be considered by teachers, curriculum developers and researchers who are studying environmental education and teacher education. What shapes pro-environmental behaviors is still considered as a complex process; therefore, it is difficult to explain pro-environmental behaviors with one framework (Kollmus & Agyeman, 2002). In the present study, I dealt with an internal factor affecting pro-environmental behavior that is environmental motivation. More specifically, I focused on self-determined motivation toward environment and how it may be fostered in the EE classrooms. With regard to the present study, various factors were found to foster basic psychological needs and thus, self-determined motivation in the EE classroom. As PSTs worked in a group, they collectively constructed ideas and found solutions. They cited that this is an effective way and helped their learning during the discussions. Moreover, they worked with a consistent group through the course weeks and therefore, they shared their ideas easily and felt a sense of belonging. Also, the activities were student centered that is the instructor was more passive and students were more active. Thus, they learnt from each other with student guided discussion and their need for autonomy was supported. Environmental problem solving was a challenging process in the course. These challenging and also enjoyable process fostered individuals' competence and thus, intrinsic motivation (De Young, 2000). In the course, participants tried to find solutions to the problems and they realized their role in the solutions. They felt a sense of confidence to take action for the environment and later they felt initiative. Thus, their need for competence and autonomy were supported. In the last course week, some of the participants cited that they have engaged in some pro-environmental actions in their community.

These cognitive and instructional features may be integrated to EE classrooms in order to motivate self-determined pro-environmental behaviors (Darner, 2009). In EE classrooms, problem solving activities may be increased and a warm classroom

community in which people support each other and become in collaboration may be built. Some environmental actions may be introduced to students. Thus, they learn the environmental activist groups, environmental organizations in their community and people who are interested in environmental issues. These sources influence their motivation toward environment and foster self determination to take action for the environment (Pelletier, 2004, p. 221). However, it is essential to conduct more studies to learn how self- determined motivation and pro-environmental behaviors may be fostered in the classrooms.

Governments mostly promote non-self-determined pro-environmental behaviors to carry out the environmental policies. Nonetheless, especially children have the main influence on people's motivation toward pro-environmental behaviors (Pelletier, 2004). Therefore, it is critical to educate children to develop pro-environmental behaviors. In this manner, teachers play a critical role to shape and increase children's interest in environmental issues (Tuncer, Sungur, Tekkaya & Ertepınar, 2007). It is crucial to prepare pre-service science teachers who are able to give an effective environmental education and motivate them toward pro-environmental behaviors. Hence, we can educate children who are more motivated toward environment and become pro-environmentalists who engage in environmental actions (Pelletier, 2004).

Applying SDT in environmental education allows individuals to develop self-determined pro-environmental behaviors. These behaviors are more integrated to the person's self-system and more persistent and long lasting (Green-Demers, Pelletier & Menard, 1997). It is important to maintain pro-environmental behaviors to create long term solutions for the environmental problems. For example, a person may integrate carpooling in her or his lifestyle. However, it will be better when this person uses carpooling regularly in her or his life (Osbaldiston & Sheldon, 2003).

Based on the findings of the present study, some recommendations may be proposed for further researches. This study was conducted with a small sample size and it lasted about one semester. Therefore, a similar study may be undertaken with a larger

sample size including pre-service science teachers from different education faculties and different universities in order to make generalization.

Moreover, some experimental studies may be carried out so as to compare SDT guided and non-SDT guided environmental courses and measure the effect of SDT guided classes on students' basic psychological needs and self-determined motivation. Also, these studies may be longer than one semester to see the effect of self-determined motivation on pro-environmental behaviors.

In the present study, some environmental problems were used and a problem solving activity and discussion environment were created among the groups. In addition to these problems, more guest speakers who are preparing action plan to solve the environmental problems may be invited to course and also, some articles and movies or programs which address these problems may be used in the classroom. Furthermore, the course may be supported with field trips because these field trips help students understand the issue better and foster their sense of confidence. Darner (2007) asserted that by virtue of field trips, out of school context is integrated to the courses and thus, students perceive the environmental problems better. All these sources may increase the connection of individuals to the social groups who deal with environmental problems.

One of the goals of environmental education is to raise environmentally motivated citizens. However, environmental motivation is a neglected area in environmental education. There is limited research conducting SDT to promote pro-environmental behaviors. Although there are many successful applications about SDT in education and other areas, there are not enough empirical investigations in terms of SDT in EE field (Darner, 2009). Therefore, environmental educators may give more importance SDT framework to foster motivation toward pro-environmental behaviors.

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APPENDIX A

ENVIRONMENTAL PROBLEMS AND ASSIGMENTS

WEEK 1

Problem 1: The story of Easter Island

Easter Island is one of the most remote spots located in the Pacific Ocean, 3,750 km from South America and 2,250 km from the nearest inhabited island. When Europeans first explored the island, they found a barren landscape populated by fewer than 2000 people who lived in caves. However, Europeans also found that the desolate island had hundreds of gigantic statues of carved stone. This indicates that a sophisticated civilization had once lived on the island. Historians wondered how people moved statues that were 10 m high and weigh 99 tons as far as 10 km from the quarries without ropes or wheels on an island. They discovered that the island didn't always lack trees. Indeed, the island previously had a lushly forest and had hosted a society of 6000 to 30,000 people. Tragically, this civilization overused resources and eradicated all trees in the island. After conducting research on the island, the scientists discovered that when Polynesian people arrived on the island between A.D 300 and 900, it was covered with a species of palm related to Chilean wine palm. However, tree populations had declined around A.D 750 and they were largely gone by A.D 950. Moreover, islanders had eaten 6 species of land bird and 25 species of sea birds that nested on Easter Island. Today there are no native species and just one seabird species is left. With trees gone, soil has eroded away due to rapid rainwater runoff. Runoff and erosion had degraded agricultural land and decreased crop yields. Reduced production led to starvation and population decline. The once prosperous and peaceful civilization went extinct because of competition for food and warfare Easter Island (Keller& Botkin, 2008)

1. Is the story of Easter Island a unique, isolated incident or does it hold a lesson for our world today?

2. Why do you think the Easter Islanders did not or could not stop themselves from stripping their island of all its trees? Do you see similarities between the history of the Easter Island and modern history of our society? Why or why not?

3. If we continue to consume world resources as we currently do, will we encounter the same situation as Easter Island? What do you think about this issue?

Problem 2: Environment versus Economy

There were several technological advances during the World War II. Newly developed technologies caused a shift from labor-intensive processes to energy intensive processes. They led to the age of plastics and the automobile. It is the people' ideal that each family has at least one car and the freedom to drive on the open road. The green revolution coincided with the age of plastics and the automobile so that agriculture is now energy intensive and dependent on intensive fertilizer, herbicide, and pesticide use. Economic growth has reached unprecedented levels. With new technologies and consumption habits brought new environmental concerns (Mckinney, Schoch, Yonavjak, 2007)

1. What environmental concerns do you think might be emerged?

2. Compare economic concerns and environmental concerns. Does environment dominate economy or vice versa? Do you think economic growth led to environmental degradation? Why or why not?

3. How can people live harmoniously with nature? Do you think present environmental preservation efforts are sufficient? Can we achieve a sustainable life?

Homework 1: I would like you to find a case that led to an environmental degradation in the past like Easter Island prompt. This case can be from your town, city or any country you know. Analyze it critically. Write problems and threats to the environment related to this case and your suggestions for solving the problem if it is still going on.

WEEK 2
Problem 3: Paper versus Plastic

Which is less damaging to the environment, paper or plastic? Which should you use over the order? Many people answer that paper is less degrading the environment. Paper is biodegradable and recyclable.Plastic is usually not biodegradable and it may not be recycled. However, there are some pros and cons of using both paper and plastic. Numerous trees are cut down to turn into paper. Even if paper is recyclable, trees are still harvested to make the paper to begin with. When paper is recycled, its quality is lowered; recycled paper cannot be run through high-speed presses without tearing. You can use plastic over and over again but it cannot be recycled as easily as paper. Biodegradable plastics exist but currently petroleum-

based non-biodegradable plastics dominate the markets (Mckinney, Schoch, Yonavjak, 2007)

1. So, you are in the grocery and you are offered a choice of either plastic or paper. Which one do you choose? Justify your answer.

2. Do you think paper or plastic should be used more, or should the current balance be maintained? Some communities and countries have banned plastic bags entirely. Do you think using plastic should be banned in your country?

3. There are many people who say, "I am aware of environmental problems and we should protect the environment," but do not change their lifestyle to be more environmentally friendly. Why do they not behave in a more environmentally friendly way by changing their habits, despite their positive attitude toward the environment? What do you think about this issue? Explain your answer.

Homework 2: How can people change their attitudes and behaviors to the environment? I would like you to be prepared to encourage people to change their attitudes and behaviors to the environment. You can choose any environmental issue like usage of energy, water, producing wastes, air pollution, etc. Firstly, you will talk about the habits of individuals about these environmental issues that you chose and what happen when people don't behave environmentally friendly. Then, you will talk about what can be done to change people' attitudes and behaviors. You will prepare a 10-15 minute persuasive video or any presentation with your group.

WEEK 3

Problem 4: Why worry about extinction?

Some people argue that people have little need for wildlife. They view elephants, exotic tropical insects, or non-medicinal plants as having no immediate value. Therefore, they are not very concerned about them. On the other hand, others want to preserve all of nature for its own sake. They see people as intruders and insist that all extinction must be stopped. Today, many species in Turkey are endangered or about to extinct. Some of them are "İri başlı deniz kaplumbağası (*Caretta caretta*), Kelaynak (*Geronticus eramita*) in Bilecik, Fırat kaplumbağası (*Rafetus eupheraticus*) in Dicle and Fırat river, Akdeniz foku (*Monachus monachus*), Çoruh engereği (*Vipera pontica*), Dikkuyruk (*Oxyura leucephala*) in Burdur and many plant species in Anatolia" (National Geographic, July, 2009). Three species that lived in Anatolia are extinct. One of them is Gökçe

balığı (*Albirnus akili*), which is extinct because of the introduction of Sudak in the lakes. Another species is Hazar kaplanı (*Panthera tigris*), which was hunted to extinction in 1974 in Şırnak in Turkey. Finally, it is the last Anadolu parsı (*Panthera pardus*) was shot in 1974 in Beypazarı in Ankara. Now, Kelaynak is under protection but it is already extinct in its native habitat (National geographic, July, 2009).

1. As you see, like in the world, there are many extinct species in our country. First, why are these species extinct? What are the reasons for these extinctions?

2. Should we save species from extinction? Why or why not? What is the value of having a lot of biodiversity?

3. If you were to hear that a species is endangered in your town, what would you do? Would you help save this species? If so, how?

4. Are you aware of any environmental protection programs or activities going on in your community? Do you think that these programs or activities are effective?

Homework 3:I would like you to search for a case about biodiversity loss. This case can be from any source (internet, journal, newspaper) or it can be from your local environment. Then, I would like you to analyze this case critically from both an ecological and social perspective.

WEEK 4

Problem 5: Reducing ozone depletion

Total Ozone on September 29, 1997

The signing of the Montreal protocol in September 1987 was a diplomatic achievement. Twenty-seven nations signed the agreement originally and 119 additional nations signed it later. The protocol outlined a plan for eventually reducing global emissions of CFCs (chlorofluorocarbons) to 50% of 1986 levels. The original plan was to eliminate production of CFCs by 1999, but because of scientific evidence that ozone layer was being depleted faster than predicted, the timetable was shortened. The largest ozone losses occurred over Antarctica. In the Arctic, ozone losses have amounted to about a 10% reduction. Ozone losses of 3% to 10% or more were

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recorded over parts of Australia, New Zealand, South Africa and South America. Average over the planet as a whole, it appears that from 1979 to 1991, the Earth lost 3% of its stratospheric ozone (Mc Kinney, Schoch &Yonavjak, 2007). Most industrialized countries had stopped production of CFC by the end of 1995; the deadline for developing countries was the end of 2005. The increase in CFC emissions has slowed thanks to the protocol and other agreements and amendments. Nevertheless, because of the long residence time of CFCs in the stratosphere, ozone depletion will likely continue for many years to come. This is bad news; the good news is that ozone levels in the stratosphere will slowly increase in the next few decades (Keller & Botkin, 2008).

1. The ozone depletion is another complexity of air pollution. How do you think ozone depletion affects the environment and human life? Why should we worry about ozone depletion?

2. What solutions can you offer to prevent ozone depletion?

3. Is it really possible for people to change their habits? Why or why not? What does the ozone depletion story indicate?

4. The last question: How can we reduce air pollution problems? Please, explain.

WEEK 5

Problem 6 : Ilısu Dam Project- Hasankeyf
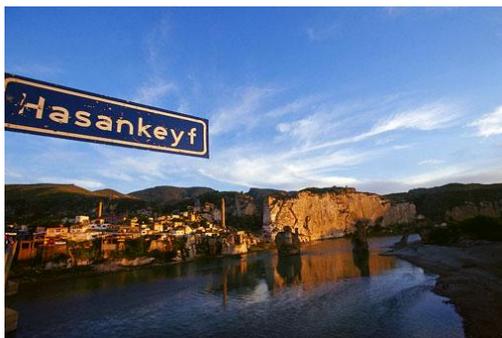
The Ilısu Dam project that is planned to build on Dicle River is highly controversial issue. Ilısu is a part of the Gap Project that covers a 75,000 km^2 area; it is one of the biggest watering and producing electricity projects. Ilısu will begin production at times when there is a high water level and electricity demand by collecting water flood in springs. However, this dam project will harm Hasankeyf which holds thousands of years of history and has cultural, religious, archeological and also ecological importance. The thousands of history will be destroyed because of the dam project that has most 50 years lifetime. When the dam is built, Hasankeyf will be inundated with water.
(http://www.dogadernegi.org/index.php).

1.How do you think the Ilısu Dam project affects culture, history, and the natural environment? Think about Hasankeyf.

2. If you took part in a Hasankeyf conservation project, what would you do to protect Hasankeyf?

3. Which one do you think is more valuable: Production of energy at Hasankeyf or history/people who live there?

4. Although many dams provide a useful service like flood control, water supply, electricity generation, all dams harm environment in some way. Do you think dams should be removed? Could you offer alternative solutions to dams (think both ecologically and economically)?

Assignment 4:

You have four options. Please select one and start to investigate.
Explain in your own words and reflect your ideas.
Do not forget adding your references.

1. Please investigate how excessive detergent usage affect environment and explain your solutions to decrease detergant consumption. What can you do to make people aware about harmful effects of detergent consumption? What can you offer instead of detergent usage?

2. Make a research about a wetland (lake, river, etc). Investigate the biodiversity of this wetland and explore the threats in the wetland. Investigate if there is water pollution and investigate the reason of water pollution in the wetland. Lastly, offer your solutions to protect this wetland.

3. Investigate water consumption and water trouble of some developed and developing countries. You can compare several countries in terms of water consumption and suggest solutions about how we can use our water in a more sustainable way.

4. From your community/city,investigate: Where does the water comes from and how is it treated? Do you think water supplies are adequate in your community? What actions should we consider to meet future needs?

WEEK 6

Problem 6: Ankara Mamak Garbage Dump

The amount of solid waste is increasing seriously today because of overpopulation, irregular urbanization, economic-social conditions and the diversity of production and consumption process. Ankara has encountered many environmental problems such as fast building, air pollution, soil pollution and solid waste recently. According to TUİK 2004 data, a person who lives in Ankara produces 1.57 kg solid waste in a day and 2.17 million ton solid waste is produced in a year. Solid wastes in Ankara have been stored in Mamak garbage dump in an uncontrolled way for 25 years. In other words, Mamak Garbage Dump was used as a wild landfill. Today, Tuzluçayır- Mamak landfills and Sincan-Çadırtepe landfills are used to store solid wastes. More than half of the wastes in Ankara are stored in these places. However, as part of Ankara solid waste management project, improvement studies have been done recently in Mamak landfill. In terms of this project, energy production and building of greenhouses are planned. In some places of the landfill, energy production from metan gases started. Despite all these improvements, Mamak garbage dump has become a threat for people living around for years.

1. How do you think uncontrolled waste storing in Mamak garbage dump affected environment in the past? Think about its effects to water, air and soil. Do you think that there is still threat for the environment and people living around Mamak garbage dump today?

2. What are your suggestions and solutions for solid waste problem in Ankara? Do you think zero waste is possible? If yes, how? Could you give any examples? If not, why not possible?

Assignment 5:

Please select two of the questions and answer them. But, the last question (the fifth question) is common. You should also answer this question, so you are required to answer three questions.

I would like you to make a research about solid waste management issue in your hometown? I want you to search about these issues:

1. How does municipality deal with solid wastes in your city?

2. Where are wastes dumped? Is there any process to handle these wastes? If yes, how is this process like? If not, what can be done to deal with these wastes?

3. How much waste does you city produce in a day or in a year? You may give statistical data.

4. What about package wastes like plastic, paper? Is there any collection - separation and   recycling facility in your city? If yes, how is this process like? If not, what can be done to generalize these facilities in your city?

5. Lastly, how can you reduce the wastes you generate each day? What kind of solutions do you have?

QUESTIONNAIRES

Kişisel Bilgiler

Formdaki ankete verdiğiniz yanıtları daha kapsamlı değerlendirebilmek için size birkaç soru sormak istiyoruz. Bu bölümde vereceğiniz yanıtların gizli tutulacağını lütfen unutmayınız.

1. **Cinsiyetiniz nedir?**

○ Bay   ○ Bayan

2. **Yaşınız?**—————

3. **Şu anda kaçıncı sınıftasınız?**

○ 1.sınıf   ○ Yüksek lisans
○ 2. sınıf   ○ Doktora
○ 3. sınıf
○ 4. sınıf

4. **Aşağıdaki aktiviteleri <u>bir yıl içinde</u> hangi sıklıkla yaparsınız?**

	Hiçbirzaman	Sıklıkla	Bazen	Arasıra
A.Kamp	○	○	○	○
B.Açık havada yürüyüş	○	○	○	○
C.Kuş gözleme	○	○	○	○
D.Balık tutma	○	○	○	○
E. Avcılık	○	○	○	○

5. Çocukluğunuzu (18 yaşında kadar) geçirdiğiniz bölge aşağıdakilerden hangisi ile tanımlanabilir?

○ Kırsal Alan, çiftlik
○ Kırsal alan, çiftlik değil (nüfusu < 2,500 kişi)
○ Küçük Kasaba (nüfüsu 2,501 ile 25,000 arası)
○ Kentsel Alan (nüfusu 25,001 ile 100,000 kişi arasında)
○ Büyük şehir (nüfusu 100,000 kişiden fazla)
○ Kararsızım

6. Anne ve babalarınızın çevre problemlerine ilgisi konusunda ne düşünüyorsunuz?

○ Çok
○ Yeteri kadar
○ Az
○ Hiç
○ Kararsızım

7. Anne ve babanız çevre korumacı davranışlar konusunda ne kadar aktifler?

○ Çok aktif
○ Biraz aktif
○ Aktif değil
○ Kararsızım

8. Anne ve babanızın eğitim seviyesi hangi düzeydedir?

○ İlkokul	○ İlkokul
○ Ortaokul	○ Ortaokul
○ Lise	○ Lise
○ Meslek Lisesi	○ Meslek Lisesi
○ Üniversite	○ Üniversite
○ Yüksek Lisans	○ Yüksek Lisans

ÇEVREYE YÖNELİK MOTİVASYON ANKETİ – 1
MOTIVATION TOWARD ENVIRONMENT(MTES)

Çevre için yapılabilecek pek çok davranış vardır. Örneğin, bazı insanlar kullanılmış şişeleri ve gazeteleri geri dönüşüme gönderirler, bazıları ise çevreyi korumaya yönelik organizasyonlara katılırlar vs. **Lütfen sizde, çevre için yapmakta olduğunuz çevre dostu davranışları düşününüz ve aşağıdaki boş yere yazınız.**

Aşağıdaki anketi tamamlarken yukarıda yazdığınız davranışları tekrar düşününüz. **Ankette kişilerin çevre dostu davranışlarda bulunmalarının olası nedenleri sıralanmıştır.** Sizde yukarıda sıraladığınız davranışları gösterme nedenlerinizin neler olabileceğini 1'den 7'ye kadar olan numaralardan birini işaretleyerek belirtiniz. **Eğer ifadenin sizi hiç yansıtmadığını düşünüyorsanız, 1' yi yuvarlak içine alınız. Bu iki durum dışında ise 1 ve 7 arasında sizi en iyi tanımladığını düşündüğünüz numarayı yuvarlak içine alınız.** Unutmayın Doğru ya da Yanlış cevap yoktur yapmanız gereken sizi en iyi tanımlayacak numarayı yuvarlak içine almanızdır.

1 --- 2 --- 3 --- 4 --- 5 --- 6 -- 7
beni hiç   beni tam olarak
yansıtmıyor   yansıtıyor

1	Çevre için faydalı olabilecek yeni yollar öğrenirken duyduğum keyiften dolayı.	1 2 3 4 5 6 7
2	Daha iyi bir çevreye sahip olmanın yollarını ararken duyduğum keyiften dolayı.	1 2 3 4 5 6 7
3	Çünkü çevreye yardım etmek akılcı bir davranıştır	1 2 3 4 5 6 7
4	Çünkü çevre için bir şeyler yaparken duyduğum heyecanı seviyorum	1 2 3 4 5 6 7
5	Çevre için bunları yaparken ne kazanabileceğim konusunda bir fikrim yok.	1 2 3 4 5 6 7
6	Sanırım çevre için bir şeyler yapmadığımda pişman olurum	1 2 3 4 5 6 7
7	Çevresel durum iyiye gitmezken, neden bunları yaptığımı merak ediyorum.	1 2 3 4 5 6 7
8	Çevreye katkıda bulunmaktan duyduğum keyif için.	1 2 3 4 5 6 7
9	Çünkü çevreyi iyileştirmek için birtakım davranışlarda bulunmak mantıklı bir şeydir.	1 2 3 4 5 6 7
10	Çünkü bu davranışları gerçekleştirmek, daha iyi bir çevreye katkıda bulunmak için seçtiğim bir yoldur.	1 2 3 4 5 6 7
11	Diğer kişiler tarafından takdir edilmek için.	1 2 3 4 5 6 7

1 --- 2 --- 3 --- 4 --- 5 --- 6 -- 7
beni hiç   beni tam olarak
yansıtmıyor   yansıtıyor

12	Çünkü çevre için bir şeyler yapmasaydım kendimi kötü hissederdim.	1 2 3 4 5 6 7
13	Çünkü çevre ile ilgilenmek yaşamımın tamamlayıcı bir parçasıdır.	1 2 3 4 5 6 7
14	Çünkü arkadaşlarım bunu yapmam konusunda ısrar ediyorlar.	1 2 3 4 5 6 7
15	Çünkü bana göre kendimle ilgilenmek ile çevreyle ilgilenmek birbirinden ayrı tutulamaz	1 2 3 4 5 6 7
16	Çünkü çevre için bir şeyler yapmasaydım kendimi suçlu hissederdim.	1 2 3 4 5 6 7
17	Çünkü çevre konusunda bilinçli olmak kim olduğumun temel bir parçasıdır.	1 2 3 4 5 6 7
18	Çünkü bu davranışlar, hayatımı yaşamak için seçtiğim yolun bir parçasıdır	1 2 3 4 5 6 7
19	Çünkü çevre ile ilgili bir şeyler yapmanın iyi bir fikir olduğunu düşünüyorum.	1 2 3 4 5 6 7
20	Dürüst olmak gerekirse bilmiyorum, aslında çevre için bir şeyler yaparken zamanımı boşa harcıyormuşum gibi bir izlenime kapılıyorum.	1 2 3 4 5 6 7
21	Bilmiyorum, çevreye yönelik bilinçli davranışta bulunma çabalarımın çevresel duruma nasıl katkıda bulunacağını anlayamıyorum.	1 2 3 4 5 6 7
22	Eleştirilmekten kaçındığım için.	1 2 3 4 5 6 7

ÇEVREYE YÖNELİK MOTİVASYON ANKETİ- 2
AMOTIVATION TOWARD ENVIRONMENT(AMTES)

Önceki anketteki soruları, çevreyi korumak için yaptığınız çeşitli davranışları ve bu davranışları niçin yaptığınızı düşünerek cevaplandırdınız. Şimdi ise sizden çevre için yararlı gördüğünüz ancak gerçekleştirmediğiniz davranışları düşünmenizi istiyoruz.Pek çok insan kendilerince çevreyi korumaya yönelik davranışlar sergilerler fakat çevreyi korumak için yapılabilecek başka davranışların da farkında olmalarına rağmen bazı sebeplerden dolayı bu davranışları yerine getirmezler. Örneğin, kimileri daha yavaş araba sürmenin enerjiyi koruduğunu ve hava kirliğini azalttığını bilir, fakat yinede hızlı sürmeye devam eder. **Lütfen sizde, şuanda yapmadığınız davranışları düşününüz ve aşağıdaki boşluğa yazınız.**

Önceki bölümde olduğu gibi, yukarıda yazdığınız bu davranışları **gerçekleştirmemenedenleriniz hakkında düşünerek** aşağıda verilen olası nedenlerin derecesini 1'den 7'ye kadar olan numaralardan birini işaretleyerek belirtiniz.

1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7
Beni hiç   Beni kısmen   Beni tam olarak
yansıtmıyor   yansıtıyor   yansıtıyor

1	Şuanda uygulanan çevreyi korumaya yönelik programların/etkinliklerin çevrenin korunmasına yardımcı olacağını **düşünmüyorum**	1 2 3 4 5 6 7
2	Var olan çevreyi korumaya yönelik programların/ etkinliklerin daha iyi bir çevreye sahip olmamıza katkısı olacağına **inanmıyorum**	1 2 3 4 5 6 7
3	Çevreyi korumaya yönelik programların/ etkinliklerin etkili **olmadığını** düşünüyorum.	1 2 3 4 5 6 7
4	Geliştirilmiş olan çevreyi korumaya yönelik programların/etkinliklerin çevresel sorunları çözmede **yetersiz** olduğunu düşünüyorum.	1 2 3 4 5 6 7
5	Çevreyi korumak için yeteri kadar çaba **göstermiyorum**.	1 2 3 4 5 6 7
6	Alışkanlıklarımı değiştirmek için çaba **sarfetmiyorum**	1 2 3 4 5 6 7
7	Kendimde yeterli derecede özveride bulunma gücünü **bulamıyorum.**	1 2 3 4 5 6 7
8	Çevre için bu gibi şeyleri yapmak zaman alıyor; zamanımı etkili kullanmak için çaba **sarfedemiyorum.**	1 2 3 4 5 6 7

1 ---- 2 ---- 3 ---- 4 ---- 5 ---- 6 ---- 7

| Beni hiç | | Beni kısmen | | Beni tam olarak |
| yansıtmıyor | | yansıtıyor | | yansıtıyor |

9	Bu gibi davranışları sergileyebilmek için kendimi yeterli **hissetmiyorum.**	1 2 3 4 5 6 7
10	Çevrenin korunmasına yönelik sergilenebilecek. davranışlar arasından akıllıca seçim **yapamıyorum.**	
11	Bu davranışları sergileyebilmek için gerekli hiçbirşeye **sahip değilim.**	1 2 3 4 5 6 7
12	Çevreyi korumaya yönelik programların/ etkinliklerin olduğunu biliyorum, fakat bunları uygulamak için yeterli kapasiteye sahip olduğumu **düşünmüyorum.**	1 2 3 4 5 6 7
13	Çevrenin korunmasına yönelik yaptığım küçük şeylerin, büyük ölçekte bir etkisi **olmayacaktır.**	1 2 3 4 5 6 7
14	Ekolojik yıkımın boyutu o kadar büyük ki, benim davranışlarımın bu durum üzerinde herhangi bir etkisi olması **mümkün değil.**	1 2 3 4 5 6 7
15	Ekolojik problemlerin ağrılığıyla kendimi o kadar ezilmiş hissediyorum ki, bu problemlerin çözümü için yapabileceğim hiçbir şey **olmadığını** düşünüyorum	1 2 3 4 5 6 7
16	Çevresel problemler oldukça büyük ve benim var olan durumu değiştirebileceğimi **düşünmüyorum**	1 2 3 4 5 6 7

DAILY NEED SATISFACTION SCALE (DNSS)

Instructions: Please respond to each statement by indicating on the 1-7 scale how true it is for you while you participated in class today. Please only answer according to how you felt **today**, not at another time.

Scale:
Not at all true Very true
1 23 4 5 6 7

1	While participating in class today, I felt free to be who I am.	1 2 3 4 5 6 7
2	While participating in class today, I felt like a competent person	1 2 3 4 5 6 7
3	While participating in class today, I felt cared about.	1 2 3 4 5 6 7
4	While participating in class today, I often felt inadequate or incompetent.	1 2 3 4 5 6 7
5	While participating in class today, I had a say in what happened, and I could voice my opinion.	1 2 3 4 5 6 7
6	While participating in class today, I often felt a lot of distance with my classmates.	1 2 3 4 5 6 7
7	While participating in class today, I felt very capable and effective.	1 2 3 4 5 6 7
8	While participating in class today, I felt closeness and familiarity.	1 2 3 4 5 6 7
9	While participating in class today, I felt controlled and pressured to be a certain way.	

LEARNING CLIMATE QUESTIONNAIRE & CONNECTEDNESS

SUBSCALE OF THE CLASSROOM COMMUNITY

The items on this questionnaire are related to your experiences in this class. Please use the
1-7 scale to indicate how much you agree with each statement. Please be honest.

Scale:

1 2 3 4 5 6 7

strongly	**not**	**strongly**
disagree	**sure**	**agree**

1	I feel that my instructor provides me choices and options.	1 2 3 4 5 6 7
2	I feel understood by my instructor.	1 2 3 4 5 6 7
3	My instructor conveys confidence in my ability to do well in this course.	1 2 3 4 5 6 7
4	My instructor encourages me to ask questions.	1 2 3 4 5 6 7
5	My instructor listens to how I would like to do things.	1 2 3 4 5 6 7
6	My instructor tries to understand how I see things before suggesting a new way to do things.	1 2 3 4 5 6 7
7	I feel that students in this course care about each other.	1 2 3 4 5 6 7
8	I feel connected to others in this course.	1 2 3 4 5 6 7
9	I do not feel a spirit of community in this course.	1 2 3 4 5 6 7
10	I feel that this course is like a family.	1 2 3 4 5 6 7
11	I feel isolated in this course.	1 2 3 4 5 6 7
12	I trust others in this course.	1 2 3 4 5 6 7
13	I feel that I can rely on others in this course.	1 2 3 4 5 6 7
14	I feel that members of the course depend on me.	1 2 3 4 5 6 7
15	I feel uncertain about others in this course.	1 2 3 4 5 6 7
16	I feel confident that others in this course will support me.	1 2 3 4 5 6 7

ÇEVRE TUTUM ÖLÇEĞİ

(ENVIRONMENTAL ATTITUDE QUESTIONNAIRE)

Aşağıda çevre sorunlarına yönelik düşünceler göreceksiniz. Belirtilen ifadelere ne derecede katıldığınızı yada katılmadığınızı ilgili seçeneği işaretleyerek belirtiniz.

1 Kesinlikle Katılmıyorum	2 Katılmıyorum	3 Karasızım	4 Katılıyorum	5 Kesinlikle Katılıyorum	6 Bilmiyorum

1	Dünyada çevre kirliliği tehlikeli düzeyde değildir.	1 2 3 4 5 6
2	İnsanoğlu yaşamını sürdürebilmek için doğa ile uyum içinde yaşamak zorundadır.	1 2 3 4 5 6
3	Çevre kirliliği geçici bir problemdir.	1 2 3 4 5 6
4	Türkiye'de çevre kirliliği sorunu **yoktur.**	1 2 3 4 5 6
5	Endüstrileşmiş toplumlar insanlara yüksek yaşam standardı sunar.	1 2 3 4 5 6
6	İnsanlar adaptasyona yatkındır, bu nedenle kirlenmiş bir çevrede yaşamaları problem **olmaz.**	1 2 3 4 5 6
7	Çevre sorunlarının çözülmesi, yaşama alışkanlıklarımızda önemli değişiklikler yapmamızı gerektirir	1 2 3 4 5 6
8	Çevrenin korunması ekonomik büyümeden daha önemlidir.	1 2 3 4 5 6
9	Dünya'nın yaşamı desteklemekle ilgili doğal yeteneğini aşmak üzereyiz.	1 2 3 4 5 6
10	Çevre kirliliğini önlemek devletin sorumluluğudur.	1 2 3 4 5 6
11	Teknolojini yararları, zararlarından daha fazladır.	1 2 3 4 5 6
12	Nükleer bir kazanın çevreyi kirletme olasılığı gitgide artmaktadır.	1 2 3 4 5 6
13	Dünyadaki yetkililer, nüfus artışını azaltacak önlemler alacak ve nüfus artışı gelecekte problem **olmayacaktır.**	1 2 3 4 5 6
14	Doğal kaynaklarımızı gelecek nesiller için korumalıyız.	1 2 3 4 5 6
16	Çevre sorunları her zaman vardır ve çözülmektedir, bu nedenle gelecekle ilgili kaygı duymaya gerek **yoktur**.	1 2 3 4 5 6
17	Bilim ve teknoloji, herhangi bir çevre sorununu kontrol edebilecek hızla gelişmektedir.	1 2 3 4 5 6
18	Arabalardan kaynaklanan eksoz gazları iklim değişikliklerine yol açmaktadır	1 2 3 4 5 6
19	Tüketim alışkanlıklarımızı değiştirmezsek, toprak kalitesi ve tarım topraklarının kaybı hiçbir bitkinin yetiştirilemeyeceği duruma gelecektir.	1 2 3 4 5 6
20	Türkiye'nin endüstrileşmeye gereksinimi vardır, bu durumda endüstrileşmenin neden olduğu çevre kirliliği göz ardı edilebilir.	1 2 3 4 5 6

21	Bilim ve teknoloji, çevre ile ilgili problemleri belirler ve çözer; bu yüzden bu konuların gelecekte önemi **kalmayacaktır**.	1 2 3 4 5 6
22	Nükleer atıkları depolamak çok tehlikelidir.	1 2 3 4 5 6
23	Ülkemizde nesli tükenmekte olan birçok bitki ve hayvan türü bulunmaktadır.	1 2 3 4 5 6
24	Çevre kirliliğinin önlenmesinde bireylerin sorumlulukları çok önemlidir.	1 2 3 4 5 6
25	Tüketim alışkanlıklarımızı değiştirmezsek, ozon tabakasındaki deliğin büyümesi devam edecektir.	1 2 3 4 5 6
26	Ankara, İstanbul ve İzmir gibi büyük kentlerde nüfus arttıkça, çevre sorunları da artmaktadır.	1 2 3 4 5 6
27	Erozyon ve çölleşme bir çevre sorunudur.	1 2 3 4 5 6
28	İnsanlık çevreyi sömürmektedir.	
29	Türkiye'de doğal kaynak açısından zengin bir ülkedir, bu yüzden doğal kaynakların tükenmesi söz konusu **değildir.**	1 2 3 4 5 6
30	Yaşam tarzımızda değişiklik yapmayı doğal kaynakların yok olmaması için kabul edebiliriz.	1 2 3 4 5 6
31	Alışveriş merkezlerinde uzun zaman geçirmek, tüketimi ve doğal kaynak kullanımını olumsuz yönde etkileyen bir yaşam tarzıdır.	1 2 3 4 5 6
32	Doğal kaynaklarımızı kendi neslimiz yararına kullanmalıyız.	1 2 3 4 5 6
33	Dinozorlar doğal nedenler yüzünden yok oldu ama, deniz kaplumbağalarının sayılarının azalmasının nedeni insanlardır.	1 2 3 4 5 6
34	Çevre kirliliğinin nüfus artışı ile hiçbir ilgisi **yoktur.**	1 2 3 4 5 6
35	Çevre kirliliği insan sağlığını olumsuz yönde etkiler.	1 2 3 4 5 6
36	Denizlerin içinde yüzülemeyecek kadar kirli hale gelmesi doğal bir olaydır.	1 2 3 4 5 6
37	Güneş, rüzgar ve su gibi doğal enerji kaynakları hiçbir zaman **tükenmeyecektir,** bu yüzden dünyada enerji sıkıntısı söz konusu **olmayacaktır.**	1 2 3 4 5 6
38	Herhangi bir aktiviteyi değerlendirirken, herşeyden önce çevreye etkisini göze almalıyız.	1 2 3 4 5 6
39	Önümüzdeki birkaç yıl içinde çevre sorunları sona erecektir.	1 2 3 4 5 6
40	Toplum, doğa korumacı davranışları desteklemelidir.	1 2 3 4 5 6
41	Tüketim alışkanlıklarımızın doğal kaynakların tükenmesi ile ilgisi **yoktur.**	1 2 3 4 5 6
42	Türkiye'deki çevre sorunlarının çözümü ile çevre bilincinin yaygınlaştırılması yakından ilgilidir.	1 2 3 4 5 6
43	Doğal kaynakların sürdürülebilir kullanımı, kaynakların sürekli kullanımı demektir.	1 2 3 4 5 6
44	Su ve elektrik kullanırken tasarruflu davranmak, doğal kaynakların sürdürülebilir kullanımı açısından önemlidir.	1 2 3 4 5 6
45	Herkesin çevre kirliliğine etkisi vardır, ancak bu etki tüketim alışkanlıklarına göre değişir.	1 2 3 4 5 6

APPENDIX C

INTERVIEW PROTOCOL

GÖRÜŞME SORULARI

1.Şimdi birlikte dersten alınmış videolardan bir bölüm izleyeceğiz. Videoyu izlerken grubunla birlikte neler yapmaya çalıştığını biraz anlatır mısın?

2.Derste verilen bu problemi çözmenin önemli olduğunu düşündü mü? Ders sırasında bu problemi çözmen gerektiği söylenmeseydi (beklenmeseydi) senin için yinede önemli olur muydu? Neden ya da neden değil?

3. Bu problemi çözmeye çalışırken, sana yardım eden (bilgi, grup üyelerinin yorumları ya da öğretmenin yorumları gibi) ya da problemi çözmende yararlı olduğunu düşündüğün bir şeyler var mıydı? Lütfen bu konuda detaylı bilgi verebilirmisin?

4.Ders sırasında problemin çözümüne gerçekten etkili bir şekilde katkıda bulunabildiğini düşündün mü? Neden ya da neden değil? (Neden etkili şekilde katkıda bulunup bulunmadığını göstermeleri beklenir).

5.Problemin çözümüyle ilgili yaptığın önerilerinin grup arkadaşların tarafından dikkate alındığını düşündün mü? Neden ya da neden değil?

6.Katkıda bulunabileceğini düşündüğün fakat bazı sebeplerden dolayı konu dışında kalan, katkı sağlamayan başka bir şey var mıydı? Eğer varsa neydi?
(Problemi çözerken katkıda bulunmak istediğin fakat konuyla alakasız olur diye eklemediğin, yada arkadaşların tarafından önemsenmez diye düşündüğün, bu yüzden söylemek istemediğin herhangi bir bilgi varmıydı?)

7.Ders aktiviteleri esnasında en çok hoşuna giden bölümü neresiydi, anlatabilir misin?

APPENDIX D

WHOLE SYSTEMS RUBRİC AND REFLECTION QUESTİON
Which of the following best describes how your group rates the completion of your group project? Have a discussion with your group and come to about where your project fits. Please be honest and be able to back up your decision with an explanation. You will be asked to provide this explanation individually in writing. These are not listed in any particular order.

Group Name and Your name:

A	B	C	D	E
This project shows that: I can identify and describe parts of the system; I can describe the connections between the parts of the systems and explain how the parts depend on each other through those connections; I see patterns in those connections; I recognize that diverse perspectives can enable us to recognize interdependencies in systems and come to better environmental solutions.	This project shows that: I can identify and describe parts of the system.	This project shows that: I can make choices and decisions and take actions that benefit the health of the whole system; I know that these actions are beneficial because I can explain how parts of the system depend on the health of the whole system; I know how to participate in a functioning team that represents diverse perspectives; I know these perspectives enable us to recognize interdependence in systems and come to better environmental solutions.	This project shows that: I can identify and describe parts of the system; I can describe the connections between the parts of the systems and explain how the parts depend on each other through those connections; I recognize that diverse perspectives can enable us to recognize interdependencies in systems and come to better environmental solutions.	This project shows that: I can identify and describe parts of the system; I see the system itself as a whole; I looked for and identified connections between the parts of the system.

1. Please, write your explanation: Why did you choose that column?

2. What you learned preparing this project? In other words, what this project contributed to you?

3. What helped you while preparing the project? (your knowledge, comments of your friends, instructor, community, other people, etc...). Please, explain.

4. Did you feel you could effectively contribute the project? Why or why not? Please explain.

5. Did you feel like your suggestions were taken seriously by your group mates? Why or why not? Please, explain.

6. Do you think that your project may help improve the environmental problem in terms of your topic and how it may help or not? Please, explain.