ANALYZING THE EFFECTS OF PERSONALITY TRAITS ON THE SUCCESS OF ONLINE STUDY GROUPS

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ABSTRACT

ANALYZING THE EFFECTS OF PERSONALITY TRAITS ON THE SUCCESS OF ONLINE STUDY GROUPS

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The purpose of the study is analyzing how efficient online study groups can be formed among university students based on their personality traits, and investigating whether a relationship exists among personality traits, social media use and success of online study groups. A survey which consisted of Ten Item Personality Inventory and the questions about social media use was conducted among the students. Then, the students were assigned to small online groups (consisted of 2 or 3 members) based on their personality characteristics homogeneously or heterogeneously. In total 35 groups were formed, and the group members studied on a simple task collaboratively by communicating via METU-Online forum. By using a causal-comparative design, the effects of the personality characteristics of group members on group success, and the characteristics of the influential students in online groups were investigated. As a result of the study it has been found that besides personality characteristics of the students, other factors (such as the faculty of the students, gender, and the number of days that they spent on completing the study) were found effective on the group success. Also it has been found that more extravert or more open students tend to be more influential on others, and that they use higher number of social networking web-sites.

Keywords: Big Five personality traits, Computer supported collaborative learning, online group success, group influence, social media use

ÖZ

KİŞİLİK ÖZELLİKLERİNİN ÇEVRİMİÇİ ÇALIŞMA GRUPLARININ BAŞARISI ÜZERİNDEKİ ETKİSİNİN ANALİZİ

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Çalışmanın amacı, üniversite öğrencilerinin kişilik özellikleri kullanılarak daha verimli çevrimiçi grupların nasıl oluşturulabileceğini incelemek ve kişilik özellikleri, sosyal paylaşım siteleri kullanımı ve çevrimiçi çalışma grup başarısı arasındaki ilişkileri incelemektir. Öncelikle, öğrencilere On Maddeli Kişilik Ölçeği ve sosyal medya kullanımını ölçen sorulardan oluşan bir anket uygulanmıştır. Daha sonra, öğrenciler kişilik özelliklerine göre küçük çevrimiçi gruplara (2 ya da 3'er kişilik) gruplar homojen ya da heterojen olacak şekilde atanmıştır. Toplamda 35 grup oluşturulmuş ve grup üyeleri verilen basit bir aktivite üzerinde METU-Online forumu üzerinden iletişim kurarak işbirlikçi bir şekilde çalışmışlardır. Nedensel karşılaştırmalı bir yöntem kullanılarak, grup üyelerinin kişilik özelliklerinin grup başarısına olan etkisi ve çevrimiçi gruplardaki etkili öğrencilerin kişilik özellikleri incelenmiştir. Çalışmanın sonucunda, kişilik özelliklerinin yanı sıra diğer faktörler (örneğin; öğrencilerin bağlı oldukları fakülte, cinsiyet ya da aktivite üzerinde çalıştıkları toplam gün sayısı) grup başarısı üzerinde etkili bulunmuştur. Ayrıca, daha dışa dönük ve daha açık öğrencilerin diğer öğrenciler üzerinde daha

etkili oldukları ve bu öğrencilerin daha fazla sayıda sosyal medya sitesi kullandıkları sonucuna varılmıştır.

Anahtar Kelimeler: Büyük Beş kişilik özellikleri, Bilgisayar destekli işbirlikli öğrenme, çevrimiçi grup başarısı, grup etkisi, sosyal medya kullanımı

This thesis is dedicated:

To the memories of my father Osman Küçüközer,
of my grandmother Hidayet Özdemir,
and
to the most precious person in my life, my mother Muazzez Küçüközer

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LIST OF ABBREVIATIONS

16PF: 16 Personality Factors

BFI: Big Five Inventory

CART: Classification and Regression Tree

CSCL: Computer Supported Collaborative Learning

ELT: Experiential Learning Theory

HEXACO: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, Openness to Experience

IS100: Introduction to Information Technologies and Applications course

KTS: Keirsey Temperament Sorter

LOOCV: Leave-One-Out Cross-Validation

LSI: Learning Style Inventory

MBTI: Myers-Briggs Type Indicator

METU: Middle East Technical University

MSE: Mean Squared Error

NEO-FFI: Neuroticism, Emotional Stability, Openness – Five Factor Inventory

NEO-PI: Neuroticism, Emotional Stability, Openness – Personality Inventory

NEO-PI-R: Neuroticism, Emotional Stability, Openness – Personality Inventory-Revised

TDA: Trait-Descriptive Adjectives

TIPI: Ten Item Personality Inventory

WBIE: Web-based Instructional Environment

CHAPTER 1

INTRODUCTION

In this first chapter, the background and the purpose of this study, the research questions, significance of the study and the definition of the terms used throughout the thesis are introduced respectively in the subsections.

1.1. Background of the Study

From the mid-1990s to nowadays the computers have been using for educational purposes, especially to gather students on a platform, and collaborate with each other. It is called "Computer-Supported Collaborative Learning (CSCL)", and it is still growing with the development of the technology. New opportunities for collaborative learning have been offered with the new types of social networking, and mobile technologies (Laurillard, 2009). Also, in the recent years online courses and online learning have become more popular. For example; Coursera.com launched in 2012 which has over 4 million students from all over the world follow the lectures online.

It has been challenging for instructors to form student groups for collaborative learning. When it comes to online setting, it is not different. Learners' different perceptions, personalities, cognitive abilities are the examples of such challenges. There is a wide range of studies that aim to bring a new perspective for these challenges such as the studies of Caspi, Chajut, Saporta, and Beyth-Marom (2006), Chen and Caropreso (2004), and Luse, McElroy, Townsend, and DeMarie (2013).

The effects of personality on academic performance were investigated by the researchers. For example; Chamorro-Premuzic, and Furnham (2003) found that students high on conscientiousness are more likely to be successful than the students low on conscientiousness. Regarding to these studies, in order to increase the success and efficiency of collaborative study groups, forming groups according to the personalities of students has been widely discussed. Horreo, and Carro (2007) conducted a study among university students to investigate group forming of the students basically depending on personalities (homogeneous or heterogeneous). Pieterse, Kourie, and Sonnekus (2006) also showed that diversity on personality is a strong predictor of group success among software engineering teams. Chen and Caropreso (2004) found that personality affects communication type, task engagement among groups on online setting. Recently, Salleh, Mendes and Grundy (2012) studied the effects of Conscientiousness, Neuroticism, and Openness on pair programming. Rhee, Parent, and Basu (2013) also investigated the effects of ability and personality on group performance among undergraduate students, and found that Extraversion is positively related to group performance.

Another recent study area of the researchers is the relation between influence and personality. Many studies investigate different aspects of the relation between the two. Judge, Bono, Ilies, and Gerhardt (2002) investigated whether personality traits are effective on leadership. The study of Harms, Roberts, and Wood (2007) also shows the two of Big Five personality traits are effective on social influence in groups. Deuling, Denissen, van Zalk, Meeus, and Aken (2011) studied the influence in groups over time, and whether effective traits are changing at different stages.

Motivated from the studies mentioned above, the purpose of this study and research questions, the significance of the study are given in next sections.

1.2. Purpose of the Study and Research Questions

The main purpose of the study is to investigate how efficient small online study groups can be formed based on the personality characteristics. In this study, especially we aim to form different types of groups, and explore the differences between group successes. The other focuses of the study can be summarized as (1) exploring how group members collaborate within different types (homogeneous and heterogeneous) of groups, (2) exploring which members are

effective on other members and what type of personality they have commonly, (3) investigating personality differences that affect social media use.

Based on the purposes mentioned above, the following research questions are guided throughout the study:

1) What type of groups depending on the personality characteristics of group members are efficient for collaboration on online setting?
2) Which group members have an influence on other members when collaborating on online platform? What are their common personality characteristics?
3) Which personality traits are effective on social media use?

1.3. Significance of the Study

As online courses and online collaboration platforms arise all around the world, computer supported collaborative learning (CSCL) is also becoming a current issue. Just like in face-to-face courses, collaborative study is an effective way for learning (Palloff & Pratt, 2010). Online study groups increase the efficacy of learning. On the other hand, it has been argued how groups should be formed, what factors should be considered when forming groups. Many studies were conducted and continue to be conducted on this topic; different aspects are considered such as cognitive abilities (Chen & Macredie, 2002), personality characteristics (Chen & Caropreso, 2004), or both (Luse, McElroy, Townsend, & DeMarie, 2013).

When forming virtual (online) teams, social aspects of group members is one of the criteria that should be considered. According to Lee, Bonk, Magjuka, Su, and Liu (2006) members who are socially familiar or emotionally bounded can work as a team more easily than who do not. Muehlenbrock (2006) states that group quality can be increased by forming groups according to students' profiles and user-context information. Also, several studies such as Pieterse et al. (2006) show that similarity or diversity on the personality of team members affects group success. Recent studies such as Luse et al. (2013) focus on the working preference in virtual teams, and their results show that personality characteristics of the participants affect group performance. When looking at these past and latest studies, it can be said that forming virtual teams based on the personality characteristics maintains its importance.

In online study environments it is also an important issue which members are effective on others, or what their personality characteristics are. By determining influential members, they can be targeted in order to spread new ideas, new teaching material etc. among the group. They can be seen as the central points to access other students more easily when instructors need to intervene in the students.

Based on the studies mentioned above, it is hypothesized that success of groups whose members have the same personality characteristics are higher than the ones whose members are different on personality in online environment. Also, we aim to find the personality characteristics of influential students in online groups. The results of this study may contribute to the existing literature when forming online study groups and understanding members' behavior.

1.4. Definition of Terms

Big Five Personality Traits: Big Five Personality Traits are the personality dimensions in order to define personality characteristics broadly in psychology. Five traits are Extraversion, Agreeableness, Conscientiousness, Emotional Stability (or reversely Neuroticism), and Openness.

Computer Supported Collaborative Learning (CSCL): CSCL is a kind of learning where participants interact with each other using computers or internet.

Online Groups (or Virtual Groups): Online group refers to the team of individuals who communicate using communication technology.

Social Influence: Social influence can be referred as being affected by the emotions, thoughts, or behaviors of other people.

CHAPTER 2

LITERATURE REVIEW

In this chapter, the literature review is presented. First, the history of the personality traits and Big Five Model is given. Different types of questionnaires used to measure Big Five Personality Traits are briefly explained. Then, the use of personality traits in several domains is given such as: group (team) work domain, group influence domain, and lastly social media use domain. The previous studies in the literature are summarized in the subsections.

2.1. Trait Theory

The first studies on constructing personality traits started by Klages (1926), and Allport, and Odbert (1936) (John & Srivastava, 1999). Allport, and Odbert (1936) listed all the terms about the behaviors of one human being to distinguish, and the list consisted of about 18000 terms. Then they categorized these terms into four: personality traits, temporary states, evaluative judgments of personal conduct and reputation, and physical characteristics.

Since the number of terms was too overwhelming, Cattell (1945) tried to reduce this number. He decreased the number to 12 after a series of studies. These 12 traits were a part of his "16 Personality Factors (16PF)" (Cattell & Eber, 1950).

Fiske (1949) generated a much simpler version of Cattell's variables; this version is known as Big Five today. Tupes and Christal (1961) reinvestigated Fiske's study on different populations. Norman (1963), Borgatta (1964), and Digman and Takemoto-Chock (1981) replicated the study of the five-factor model. These five factors are known as: Extraversion or Surgency,

Agreeableness, Conscientiousness, Emotional Stability versus Neuroticism, Openness or Intellect (John & Srivastava, 1999). Goldberg (1981) gave the term "Big Five" to these traits.

Other than Big Five Personality Traits, the well-known other trait models are 16 Personality Factors (Cattell & Eber, 1950), and HEXACO model (Ashton et al., 2004). 16 Personality Factors can be given as Warmth, Reasoning, Emotional Stability, Dominance, Liveliness, Rule-Consciousness, Social Boldness, Sensitivity, Vigilance, Abstractedness, Privateness, Apprehension, Openness to Change, Self-Reliance, Perfectionism, and Tension. As discussed previously, Big Five Personality Traits are derived from 16 Personality Factors. HEXACO is the abbreviation of 6 traits which are Honesty-Humility (H), Emotionality (E), Extraversion (X), Agreeableness (A), Conscientiousness (C), and Openness to Experience (O). This model is very similar to Big Five with addition to Honesty-Humility (H) factor. Lee and Ashton (2013) discussed the relation between Big Five and HEXACO, and stated that HEXACO predicted Big Five scales well. Since HEXACO is rather new method to measure personality, the researchers generally use Big Five Traits in their studies because of its reliability and simple measures.

2.1.1. Big Five Personality Traits and Related Instruments

With the help of several researchers, the broad levels of Cattell's 16 Personality Factors are defined under the following five traits:

- *Extraversion (or Surgency):* The definition of Extraversion by John and Srivastava (1999) is "Extraversion implies an energetic approach to the social and material world". Individuals who are high on Extraversion are defined as talkative, assertive, energetic (John & Srivastava, 1999), sociable, fun-loving, affectionate, and friendly (McCrae & Costa, 1987).
- *Agreeableness (versus Antagonism):* Individuals who are high on Agreeableness are defined as good-natured, cooperative, and trustful (John & Srivastava, 1999). The opposite term of Agreeableness is Antagonism, and antagonistic people are mistrustful, skeptical, callous, unsympathetic, uncooperative, stubborn, and rude (McCrae & Costa, 1987).
- *Conscientiousness:* According to John and Srivastava (1999) "Conscientiousness describes socially prescribed impulse control that facilitates task- and goal-directed

behavior". Conscientious individuals are orderly, responsible, dependable (John & Srivastava, 1999), reliable, hardworking, well-organized, and self-disciplined (McCrae & Costa, 1987).

- *Neuroticism (versus Emotional Stability):* Neuroticism is defined by the terms worrying, insecure, self-conscious, temperamental in the study of McCrae, and Costa (1987). The opposite of Neuroticism is Emotional Stability, and the individuals who are emotional stable are defined as calm, and not easily upset (John & Srivastava, 1999).
- *Openness to Experience:* Openness is characterized by original, imaginative, broad interests, daring (McCrae & Costa, 1987), intellectual, and independent-minded (John & Srivastava, 1999).

The Big Five Traits can be seen with their broad and lower levels in Figure 1 which is adapted from Salleh, Mendes, and Grundy (2012). Lower levels show the related personality characteristics under that trait, they are also called as "facets".

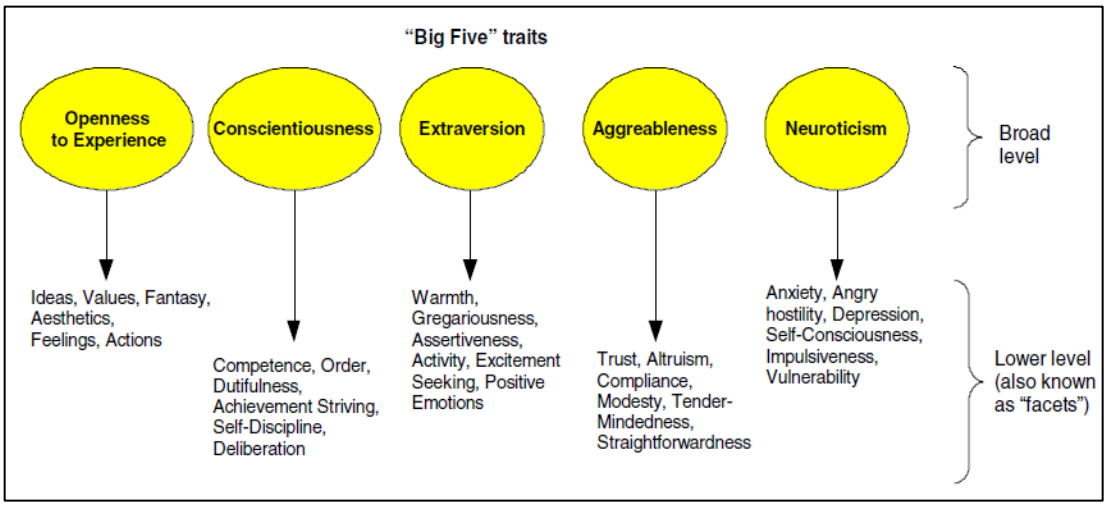

Figure 1: Big Five Model (adapted from Salleh et al, 2012)

There are several types of instruments which measure the Big Five Personality Traits. The first one is NEO Personality Inventory (NEO-PI) constructed by Costa, and McCrae (1985). But this instrument only covered Neuroticism, Extraversion, and Openness. The two of the five traits excluded in this instrument. Costa and McCrae (1992) included all the five traits and six specific facets per factor in their instrument called "NEO Personality Inventory-Revised (NEO-

PI-R)". NEO-PI-R is the most comprehensive instrument which consists of 240 items, and takes approximately 45 minutes to complete (Gosling, Rentfrow, & Swann Jr., 2003). Since it is too lengthy, Costa and McCrae (1992) provided a shorter instrument which is called NEO-Five Factor Inventory (NEO-FFI), and consisted of 60 items. Another short instrument for Big Five is constructed by John, Donahue, and Kentle (1991) (see also Benet-Martinez & John, 1998) which is called Big Five Inventory (BFI) with 44 items (John & Srivastava, 1999). Goldberg (1992) also constructed an instrument called Trait-Descriptive Adjectives (TDA) which consists of 100 items. John, and Srivastava (1999) specifies the reliability measures for TDA, BFI, and NEO-FFI as .89, .83, and .79 respectively. Lately Gosling et al. (2003) also constructed "a very brief measure" for Big Five Traits called "Ten Item Personality Inventory (TIPI)". The purpose of this instrument is to give quick and reliable measure for personality items because of the long instruments bother participants. As the name suggests, TIPI consists of 10 items for 5 traits. Gosling et al. (2003) stated that TIPI has adequate level reliability, and when a short instrument is required, it can be utilized.

2.1.2. Other Types of Personality Measures

Other two type of personality instruments used in the studies are Myers-Briggs Type Indicator (MBTI) (Briggs-Myers & Myers, 1980) and Keirsey Temperament Sorter (KTS) (Keirsey & Bates, 1984). The main difference between two is that the MBTI is focused on what people think, whereas KTS is focused on long term behaviors of people (Omar, Syed-Abdullah, & Hussin, 2010).

The MBTI is a psychometric instrument, and it was designed to assess psychological preferences in how people perceive the world and decide (Briggs-Myers & Myers, 1980). The MBTI classifies the people over 4 dimensions: attitude toward life (Extravert or Introvert – EI), method of perception (Sensing or Intuition – SN), method of judging (Thinking or Feeling – TF), and lifestyle (Judgment or Perception – JP) (Smith, 1989). The four dimensions are the same for the KTS. It is modeled after the MBTI by Keirsey, and Bates (1984). It can be considered as another type of instrument which measures the same dimensions.

Briggs-Myers and Myers (1980) defined the terms as following:

- EI: Extraverts are usually outgoing and enthusiastic, whereas Introverts are self-contained and reserved.
- SN: Sensors usually work in a steady pace, but Intuitives work in bursts of energy.
- TF: Thinkers often argue or debate issues for fun, whereas Feelers avoid arguments and conflicts.
- JP: Judgers find comfort in schedules, but perceivers want the freedom to be spontaneous.

2.2. Individual Learning Styles

Since the subject about this study is related to group study and group success, it is worthwhile to mention learning styles in the literature. David Kolb's learning theory which is called "Experiential Learning Theory (ELT)" can be counted as the main learning theory (Kolb, 1981). According to the ELT, learning has four-stepped process which is shown in Figure 2.

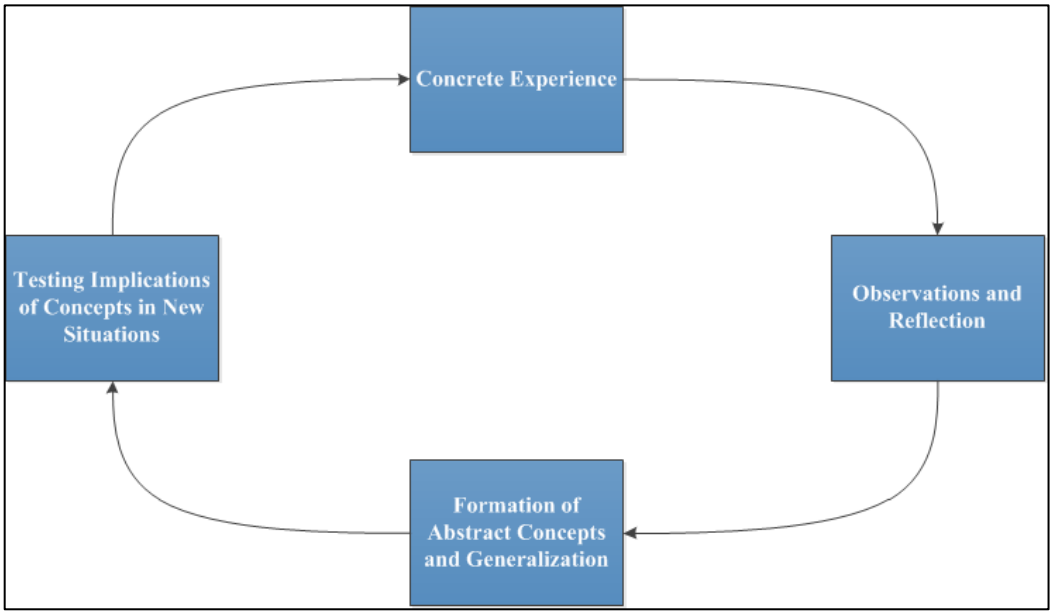

Figure 2: Four steps of ELT

Concrete Experience establishes a basis for Observations and Reflection. Then based on the observations and reflections, an individual forms abstract concepts in his/her mind and generalize it. This leads new experiences on these concepts. Then the cycle goes on in this way. Inspired from this cycle, Kolb described two primary dimensions in the learning process: abstract-concrete and abstract-reflective (Kolb, 1981). In order to measure these differences in learning process, Learning Style Inventory (LSI) is developed by Kolb (Kolb, 1981). As a result of this inventory, four types of individual learning style can be determined: Converger, Diverger, Assimilator, and Accommodator. Brief explanations adapted from Kolb (1981) for these types are given below:

- Converger: Convergers are good at the practical application of ideas. They are rather unemotional, and they prefer dealing with things instead of people. Convergers prefer studying physical sciences such as engineering.
- Diverger: It is the opposite type of Converger. They have a strong imaginative ability. They can look at the situations from different perspectives. They tend to be imaginative and emotional, and they have a wide range of interests. This type of people is suitable for humanities and liberal arts studies.
- Assimilator: Assimilators have ability on creating theoretical models. They are more interested in abstract concepts but less interested in practical use of theories so the most appropriate studying area for these people is basic sciences such as mathematics.
- Accommodator: It is the opposite type of Assimilator. They like making plans and experiments, and getting new experiences. They can be sometimes impatient. They choose to study on technical or practical areas such as business.

2.3. Group (Team) Work

In this thesis, “group” and “team” terms are used synonymously, and they refer to self-managed (or autonomous) teams. The members of the self-managed teams are responsible for a complete task, and they have free-will over the task assignments within the group (e.g. the management of the work sharing) (Kichuk, 1996).

Forming successful and efficient groups is a trending topic of the researchers in the recent years both in business domain and in educational domain. In business domain, employers want to take

advantage of their employees by forming efficient work groups. In educational domain, forming efficient group helps instructors at teaching activities, and also helps students for effective learning. In the literature, there are several studies in which the researchers investigate how efficient groups can be formed in both domains. For business domain, Big Five Personality Traits and Belbin's Roles (Belbin, 1981) are generally used for forming efficient groups. For example; Senior (1997) conducted a study among 11 management teams in organizations to explore the relation between team roles and team performance, and succeeded. The study of Blenkinsop and Maddison (2007) showed the effects of Belbin's Team Roles on defense project teams.

In educational setting, the effects of personality and team roles on team performance are also explored by many researchers. Also as discussed in previous section, there are other differences such as learning styles but in this thesis, we focus on the effects of the personality. In following subsections, the studies about group performance and personality will be discussed in detail.

2.3.1. Group (Team) Performance and Personality Traits

Team performance is defined as "the quality of the group's product as measured against an external set of pre-determined standards" by Kichuk (1996). In student teams, team performance is represented by the rating of the instructor, and this rating is commonly is task-specific (Peeters, Van Tuijl, Rutte, & Reymen, 2006).

The relation between personality and performance is suggested very long time ago, while exploration of the Big Five Personality Traits continues. Cattell (1951) suggested that team member personalities may predict the future performance. Of course, there are opposite opinions such as in the study of Mann (1959). The early studies about group performance and personality utilized other models than Big Five such as Cattell's 16 Personality Factors (e.g. Haythorn, 1953). Since early personality models provide a basis for Big Five Model (see section 2.1), the findings of these studies give clues about team members' personality and team performance.

From past to present, the findings from the studies about team performance and members' personality are given below for each five traits. The studies consist of several domains including software engineering and public policy course teams.

Extraversion: Extraverts are talkative, outgoing, enthusiastic, energetic, optimistic, and assertive (Barrick & Mount, 1991; Costa & McCrae, 1992). This definition is linked to team processes and team performance by several researchers. Before Big Five Model, dominance and sociability which are facets of Extraversion were found related to team performance. Haythorn (1953) and Bouchard (1969) specified that dominance was positively related to the performance of the group. Sociability was also found as positively related to team performance by Bouchard (1969).

Several researchers expected to find a significant relation between Extraversion and group performance in their studies (Barry & Stewart, 1997; Kichuk, 1996; Peeters et al., 2006; Rhee, Parent, & Basu, 2013; Thoms, Moore, & Scott, 1996). Historically, Thoms et al. (1996) found that Extraversion was positively correlated with self-efficacy (which is contended as the predictor of group performance by the authors) for participation in self-managed teams. Barry and Stewart (1997) found a curvilinear relation between Extraversion and group performance. They showed that intermediate levels of Extraversion in a team lead to higher performance. The most recent study of Rhee et al. (2013) also showed that mean and maximum Extraversion scores in the group were positively correlated with the written report success of the groups. They also showed that maximum level of Extraversion scores in the groups were positively correlated to oral representation success of the groups. However, Kichuk (1996), and Peeters et al. (2006) failed to find a relation between Extraversion and group performance.

Horreo and Carro (2007) investigated the relation between homogeneity/heterogeneity of the groups and group success. In their study, the students (N=22) grouped themselves, and the authors observed that the students tended to form groups in a homogeneous way. The total number of groups was 11. The students worked in groups during a semester on four tasks in laboratories, their grades obtained from these tasks represented their success. The tasks were the activities of the course called “Information and Data Structures”. As a result of the study the authors found that homogeneous groups regarding to Extraversion tended to get better results than heterogeneous groups.

Baer, Oldham, Jacobsohn, and Hollingshead (2008) investigated the group creativity levels and Extraversion levels of the groups with 145 three-student teams. The groups worked on the idea

generation tasks. The authors concluded that teams with the composition of high extraversion exhibited higher creativity.

Extraversion was found related to group performance in several previous studies as mentioned above. In this thesis study, it is also hypothesized that Extraversion level of the group members will affect the group performance.

Agreeableness: Individuals high on Agreeableness are friendly, tolerant, helpful, modest, trusted, and straightforward (Barrick & Mount, 1991; Costa & McCrae, 1992). Agreeableness was expected to be positively related to team performance (Peeters et al., 2006). Haythorn (1953) found that cooperativeness which is a facet of Agreeableness positively affected group performance. Thoms et al. (1996) showed that Agreeableness was positively related to self-efficacy for working in groups. De Dreu, and Van Vianen (2001) conducted a study among student teams (N=25). The groups consisted of second-grade students in Psychology department. The students worked on a research project. The authors found that mean and minimum levels of Agreeableness scores were positively related to team performance. Peeters et al. (2006) concluded that the elevation of Agreeableness in teams led to higher team performance in their meta-analysis. Also they found that the similar team members regarding to Agreeableness performed better in their groups.

Conscientiousness: Team members high on Conscientiousness are hardworking, organized, responsible, self-disciplined, and task-oriented (Barrick & Mount, 1991; Costa & McCrae, 1992). Conscientiousness was seen as the most related trait to individual and team performance (Kichuk, 1996; Peeters et al., 2006). Supported by several studies, Conscientiousness levels of team members affect overall performance. Thoms et al. (1996) showed that Conscientiousness was positively related to self-efficacy for participation in self-managed groups. Kichuk (1996) found that Conscientiousness levels was not effective on group performance, however heterogeneity of Conscientiousness in groups was negatively related to group performance. De Dreu, and Van Vianen (2001) used the minimum level of Conscientiousness scores of team members in their study, and they found that Conscientiousness level was positively related to team performance. Peeters et al. (2006) also found that higher average levels of Conscientiousness led to higher team performance, and the more similar members on Conscientiousness, the better their teams perform on tasks.

Interestingly, Baer et al (2008) showed that the teams with low Conscientiousness exhibited higher team creativity in their study. Recently, Salleh, Mendes and Grundy (2012) studied on the effects of Conscientiousness on the success of pair programming students. They conducted two experiments; in the first experiment 48 students involved, and 214 students involved in the second one. They conducted experiments at lab settings: Students made the software exercises with their pairs by using "pair programming" technique. The authors formed student pairs in 2 ways: Similar or mixed conscientiousness levels. As a result of these experiments they could not find a significant relation between Conscientiousness level and students' success.

Conscientiousness was found related to group performance in several previous studies as mentioned above. In this study, it is also hypothesized that Conscientiousness level of the group members will have an effect on the group performance.

Emotional Stability: The trait Emotional Stability (or reversely Neuroticism) is another most related trait to team performance. The members with high Emotional Stability scores are tend to be self-confident, and secure whereas the members with low Emotional Stability scores (or high on Neuroticism) are anxious, depressive, and insecure (Barrick & Mount, 1991; Costa & McCrae, 1992). Haythorn (1953) and Mann (1959) noted that Emotional Stability was positively related to group performance. Thoms et al. (1996) also showed that Emotional Stability was positively correlated with self-efficacy for participation in self-managed work teams.

Kichuk (1996) hypothesized that Emotional Stability would be a predictor for team performance but she failed to support this hypothesis. Salleh et al. (2012) tried to find a relation between Neuroticism level and group performance, but they could not.

On the other side, there are contradictory studies. Peeters et al. (2006) and Rhee et al. (2013) showed the negative effects of Emotional Stability on group performance. Peeters et al. (2006) concluded their meta-analysis such that there were negative effects of high Emotional Stability on team performance. Also Rhee et al. (2013) found that high Emotional Stability was shown to have negative effects on team perception.

Openness: Team members with high scores on Openness tend to be creative, imaginative, curious, and broad-minded (Barrick & Mount, 1991). Openness was investigated in the studies

relatively less than the other four traits. There are few studies which showed significant relation between Openness level of group members and group performance. One of them is the study of Horreo and Carro (2007). They showed that heterogeneous groups on Openness got better results than homogeneous ones. This finding supported the hypothesis of De Dreu, and Van Vianen (2001). They hypothesized that variability in Openness within the group would lead to higher performance, but they could not support it. Baer et al (2008) found that the groups consisted of the members with high Openness exhibited higher creativity on group tasks. However, the findings from these studies are not sufficient to show the relation between Openness levels of team members and group performance. The finding from the study of Horreo and Carro (2007) just shows the homogeneity/heterogeneity effect and the finding from the study of Baer et al (2008) shows the effect on team creativity rather than team performance.

Other than Big Five Personality Traits, it is worthwhile to mention the following studies since they contribute to different issues about personality diversity and group performance. Peslak (2006) used the Myers-Briggs Type Indicator (MBTI) to categorize personality in his study. In total 18 teams with 55 individuals were measured in order to find whether there was a relation between the diversity of the groups and group success. As a result, he showed that diversity was not significant on group grades. On the other side, the study of Pieterse et al (2006) showed the opposite. They used the Keirsey Temperament Sorter (KTS) as a measure of the personality. Software engineering teams were involved in the study, and as a result they found that diversity was a strong predictor of group success.

2.3.2. Online Participation and Personality Traits

Computer supported collaborative learning mostly requires online activities, so participation to these activities by students is important in that context. The personality characteristics of the students in collaborative teams may affect the participation to online activities. In the study of Chen and Caropreso (2004), the researchers tried to find a relation between personality and online participation of the students in an online discussion environment. Extraversion, Agreeableness, and Openness were involved in the study. The study was conducted among 70 undergraduate students, and they were assigned to one of four types of groups: High (students scored at or above 67th percentile of the sample), Low (students scored at or below 33rd percentile of the sample), High+Low (mixed), and Neutral. Each group participated to three

online discussions about educational psychology course. As a result, the authors found that students in the low group tended to post one-way messages during online discussion, and they seemed to be less able to participate in online collaborative learning. They suggest grouping high and low students together in order to increase the number of two-way messages, and engagement in the online collaborative learning.

Another study about online participation and personality traits is the study of Caspi et al. (2006). They compared the participation rate of the students in face-to-face classroom environment and a Web-based instructional environment (WBIE). The study was conducted among 214 students. The results showed that the participants and non-participants in WBIE did not have significantly different personality characteristics on five traits. Another result was that students who participated only in WBIE were characterized as introverted, and neurotic (i.e. Extraversion and Neuroticism were found related to online participation).

Luse et al. (2013) conducted a study about the effects of personality and cognitive ability on working preference in virtual teams. According to their findings, Extraversion and Openness from Big Five Model are important for an individual to work in a virtual team. They also found that cognitive ability of the individuals was also effective for working preferences in virtual teams.

2.3. Group Influence and Personality Traits

The ability to influence other people (i.e. leadership) is highly related to the characteristics of people, being affected by others is also related. The influence in groups is dependent on the group structure, too. Researchers investigated the relation between personality and group influence in their studies. Their findings show significant relations.

Hogan, Curphy, and Hogan (1994) stated "Leadership is persuasion, not domination…. Leadership only occurs when others willingly adopt. …there is a causal and definitional link between leadership and team performance". They reviewed several studies about personality and leadership features, and they concluded their findings as Surgency (or Extraversion), Agreeableness, Conscientiousness, and Emotional Stability were related to leadership.

Another reviewing study is the study of Judge et al. (2002). They reviewed the previous studies quantitatively and qualitatively. They conducted a meta-analysis depending on 222 correlations from 73 samples. They found that Extraversion was the strongest predictor for leadership. Second most correlated was Conscientiousness, and third was Openness.

Harms et al. (2007) conducted a study about personality and social status (including leadership) in social organizations. Their findings also showed that personality affects the leadership, and social influence. They found that social influence was highly related to Extraversion, and Conscientiousness.

Deuling et al. (2011) investigated the effects of personality and cognitive ability on group influence over time. They conducted 3 surveys at different time periods among students, and each time they measured the influential students in groups. Then, they showed the differences of influential students' characteristics over time. Their findings showed that at initial phases of group interaction Extraversion was an important factor on group influence. At later stages other personality factors such as Openness, Emotional Stability, and Conscientiousness were found important on group influence. According to their results group dynamics can change over time, and different characteristics appear important at different time periods.

2.4. Social Media Use and Personality Traits

Social media sites can be defined as virtual environments where users can create profiles, generate a list of other users with whom they share, and navigate through the user list which may be their own connections or made by others (Ellison, 2007). Mangold, and Faulds (2009) classified social media sites as social networking websites (e.g. Facebook, Myspace, Faceparty), data sharing websites (e.g. Youtube, Instagram, Flickr), business networking websites (e.g. Linkedin), and so on.

Before social media is not popular like in these days, the relation between personality and internet use, or the use of other online environments was investigated. Rosengren (1974) stated that personality characteristics of the users may affect their use of mass media. When world-wide web became popular overall the world, the focus of the studies moved to internet use (Amichai-Hamburger, 2002; Amichai-Hamburger & Ben-Artzi, 2003; Amichai-Hamburger,

Wainapel, & Fox, 2002). In these studies, two of the Big Five Personality Traits were found related to internet use: Extraversion and Neuroticism. Lately, the relation between personality and social media use (especially social networking sites) has been investigated by the researchers (Amichai-Hamburger & Vinitzky, 2010; Correa, Hinsley, & De Zuniga, 2010; Hughes, Rowe, Batey, & Lee, 2012; Ozguven & Mucan, 2013; Ross et al., 2009; Ryan & Xenos, 2011). These studies are mainly about the use of Facebook, and Twitter. The focus of the studies of Amichai-Hamburger, and Vinitzky (2010), Ross et al. (2009), and Ryan, and Xenos (2011) is the relation between personality and Facebook use, whereas Hughes et al. (2012) made a comparison between the use of Facebook, and Twitter.

Facebook is the largest social networking site in the world with 699 daily active users (Facebook, 2013). It was founded in 2004. The users of Facebook can create a profile, in which they can post information about themselves (Hughes et al., 2012). Twitter has 200 million active users as of February, 2013 (Twitter, 2013). Unlike Facebook, Twitter is not focused on reciprocal interaction of users (Huberman, Romero, & Wu, 2008), the main focus of Twitter is sharing the thoughts of users, or information (Kwak, Lee, Park, & Moon, 2010).

Ross et al. (2009) mainly investigated whether Big Five Personality Trait levels are effective on Facebook use, and if so the type of the use. The study was conducted among 97 students in Canada. Three of the five traits were found related to Facebook use in this study. They found that the individuals who are high on Extraversion join more Facebook groups than the ones who are low on Extraversion. They hypothesized that Extraversion level would have also an effect on the number of friends on Facebook, but they failed to support this hypothesis. They also found that Facebook wall is the favorite component of highly neurotic individuals whereas the individuals who are low on Neuroticism prefer photo uploading. Lastly, they specified that Openness to Experience is highly related to online sociability and computer-mediated communication. With this study Ross et al. inspired researchers to study on the subject of Facebook use and personality.

The study of Amichai-Hamburger, and Vinitzky (2010) extended the study for Ross et al. (2009) which measured the behaviors on Facebook via a questionnaire. Amichai-Hamburger and Vinitzky (2010) measured the information of users directly on Facebook. They created 4 dimensions on the profile information of the users: Basic information, Personal information,

Contact information and education, and Work information. In total 237 university students from Israel participated the study. The results of the study were supplementary for the study of Ross et al. (2009). Contrary to the study of Ross et al. (2009), Amichai-Hamburger, and Vinitzky (2010) found that Extraversion is related to the number of friends on Facebook, and is not related to the number of groups; highly Neurotic individuals are tend to post photos on their profiles more than the ones who are low on Neuroticism. As in the study of Ross et al. (2009), they also found that the individuals who are high on Openness are more willing to use Facebook as a communication tool. In addition, Amichai-Hamburger, and Vinitzky (2010) found that Conscientiousness and the number of Facebook friends are positively related.

In the same year, Correa et al. (2010) also studied on the personality and social media use but differently they did not focus on Facebook. They measured the participants' social media use as using instant messages, and social networking sites. They included life satisfaction, and socio-demographics (gender, race, education, and income) of the participants in their analysis. 1482 participants were contained in the study. Consistently, they found that Extraversion, and Openness to Experience are positively related whereas Emotional Stability is negatively related to social media use.

Another Facebook-oriented study about personality and social media is the one of Ryan, and Xeros (2011). Each new study brings new factors associated to social media use. Ryan and Xeros (2011) included the participants' shyness, narcissism, and loneliness levels in addition to Big Five Personality Traits. Similar to Correa et al. (2010), Ryan and Xeros (2011) found that Extraversion is positively related to the use of Facebook components such as Wall and Chat. Also they showed that Facebook non-users are more conscientious individuals than Facebook users.

Hughes et al. (2013) compared the use of Facebook and Twitter in regard to Big Five Personality Traits, sociability, and need for cognition. They split the use of Facebook and Twitter into two: informational use which is using Facebook and Twitter for gathering/spreading information, and social use. In total 300 participants were involved in the study. According to their results; (1) Extraversion is positively related to the informational use of Facebook, but is negatively related to the informational use of Twitter, (2) Conscientiousness is negatively related to the social use of Twitter, and to the informational use of Facebook, but

is positively related to the informational use of Twitter, (3) Neuroticism is positively related to the social and informational use of Facebook, but is negatively related to the informational use of Twitter, and (4) Openness is positively related to the social use of Twitter, and to the informational use of Facebook.

A recent study conducted in Turkey also shows the significant relations between personality traits and social media use. Ozguven, and Mucan (2013) additively investigated the effects of life satisfaction, gender, income, and education level on the social media use like in the study of Correa et al. (2010). The participants were 503 students in Dokuz Eylul University. They found that conscientious and open individuals use social media more.

CHAPTER 3

RESEARCH METHODOLOGY

In this chapter, the research methodology adopted in this thesis is given. The design of the study is explained in detail. The methods for developing and conducting surveys, information about participants and online study, and group formation procedures are presented.

3.1. Design of the Study

The aim of this study is analyzing the effects of personality traits on small online groups, in other words investigating whether the personality type of group members affects group success or not. In order to analyze those effects, a causal-comparative design is developed. The reason for selecting causal-comparative design is that in this type of design the independent variable among groups cannot be manipulated. When the independent variable is gender, or demographic or status characteristics etc., the most appropriate design is causal-comparative (Schenker & Rumrill, 2004).

In this study, both qualitative and quantitative research methods are used. Qualitative research methods are used for analyzing the messages among the students and open-ended questions in the surveys. Quantitative research methods are used for identifying the personality traits of the participants, their social media use, and their influence levels after conducting the online study.

As population of the study, the university students who are registered to the course called "IS100 - Introduction to Information Technologies and Applications" in Middle East Technical University (METU) in the spring semester of 2012-2013 academic year are chosen. That course is a must course in the program of several departments. The aim of the course is to introduce

basic information concepts and applications to METU students. The course is chosen since a great variety of students has to take the course (e.g. students from different departments), and the scope of the course is very applicable to study on an online platform.

As online platform where the students will study and communicate with each other, METU-Online is chosen. METU-Online is a course (or learning) management system which serves all departments of METU. It has several features as a course management system; lecturers can upload lecture notes, enter grades of students, post announcements about their courses, give assignments, make online exams, send e-mail to students, post in forum or chat with other users. Students can see published lecture notes, see their grades, also post in forum, or chat with other users. Especially the forum is very useful for discussing on a topic, so it is asked the students to use forum while studying with their group members. Using a student account, METU-Online user interface is given in Figure 3. The forum interface is given in Figure 4.

When designing an experimental or causal-comparative research, the number of data points to be used in groups is a critical. Power analysis described by Cohen (1992) is used for sample size for the target sample size for each group. Significance criterion, power and effect sizes are needed to determine the sample size for the research.

Significance criterion is defined as “The risk of mistakenly rejecting the null hypothesis” in the study of Cohen (1992). It is usually taken as .05. Power is the probability of rejecting a false null hypothesis (Cohen, 1992). For general use, it is equal to .80. Creswell (2009) defines the effect size as “Expected differences in the means between control and experimental groups expressed in standard deviation”. Small, medium and large effect sizes are equal to .10, .30, and .50 respectively.

In this study design, it is assumed that the effect size would be large so .50 is selected. When the significance is equal to .10 and the power is equal to .80, according to Cohen (1992) the sample size should be minimum 20. So it is aimed to form 20 homogeneous and 20 heterogeneous groups at the beginning of the study.

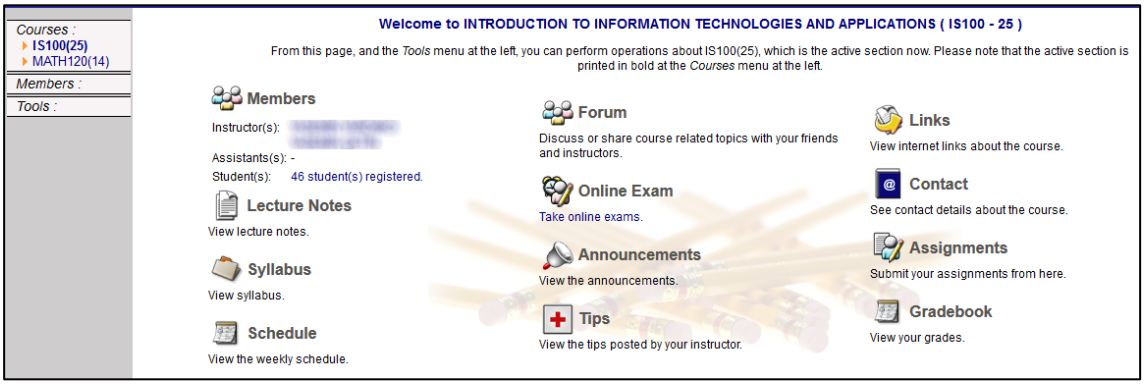

Figure 3: METU-Online Student Account User Interface

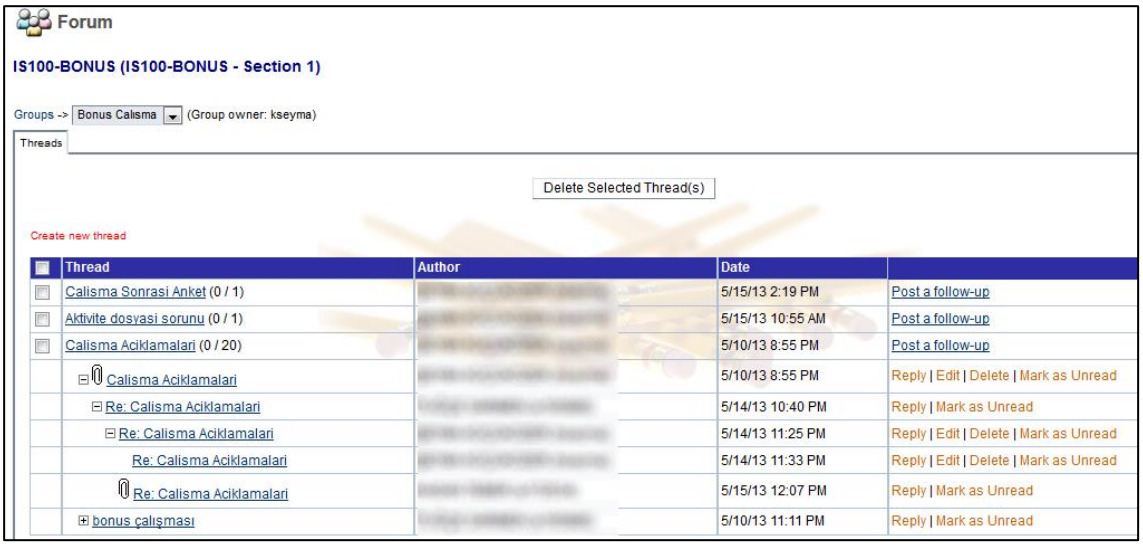

Figure 4: METU-Online Forum Interface

The students are encouraged to participate to the study in different ways. In order to increase the number of participants, a small prize is offered to the students. If they complete all phases (pre-study survey, group study on online platform, and post-study survey) successfully, they are awarded with 7 bonus points for IS100 course which will be added to their overall grade directly. Also, a web-page is prepared to reach more students and to explain them important details of the study. All rules and expectations are provided on this web site. It is tried to prepare a user-friendly interface for the web page. The main page of the web site can be seen in Figure 5. The title is selected as “Don’t you want to get 7 bonus points in 20 minutes?” to attract

the students. It is thought that they can complete the study questions in 20 minutes because the questions are adapted from a regular course activity which is completed in class hours. An IS100 class lasts totally 1 hour and 30 minutes for teaching the material and completing weekly activity in class.

Figure 5: The Main Page of the Web Site which is prepared for Online Study

Before announcing the study to all IS100 students, a small sample is selected for pilot study. The details about the pilot study are given in Section 3.2. The announcements are made via several ways. An e-mail which briefly explains the study is sent to the students. In this e-mail, the students are directed to the web page to see all the requirements for the study. Also, in face-to-face class the study is introduced directly to the students, and they are encouraged to fill in the first survey in class. The announcements are posted in IS100 Facebook Group, by Twitter

account of IS100 course, on the main page of METU-Online (login page), and on the announcement part of IS100 course on METU-Online (shown in Figure 3).

3.1.1. Pre-Study Survey

In order to identify the personality of the students and their social networking information, a pre-survey is developed. In this survey, Ten Item Personality Inventory (TIPI) is used for identifying the personality traits. One reason for selecting this scale is the length of the scale. Since there are only 10 questions in the scale, it is easy to answer these questions. Robins, Hendin, and Trzesniewski (2001) specified "…single-item questionnaires eliminate the redundancy and reduce the fatigue, frustration and boredom associated with highly similar questions repeatedly". Since there are other questions in the survey (e.g. questions about demographic information, social networking information), it is more convenient to use a shorter version of Big Five Personality Traits instruments. It is known that TIPI scale gives consistent results with other personality scales (Gosling et al., 2003). So the personality characteristics of the students are identified by using TIPI.

There are 2 questions for each 5 traits in TIPI; one of the questions directly measures the trait, and the other one measures reversely. For example; the first item of Extraversion is "I see myself as extraverted, enthusiastic" and the score gained from this item is directly calculated. The other one is "I see myself as reserved, quiet" and this one is reversely asked; so the score obtained from this item is reversed (e.g. if score is 7, it is calculated as 1; or if score is 6, it is calculated as 2). The consistency between those items for each trait is important for reliability; when detecting outliers those reverse items are considered.

Before developing the questions about social media use, the current literature was reviewed to investigate which types of questions are asked. The most of the questions are adapted from a reliable survey conducted by US Davis University of California (Facebook Survey, 2008). Although that survey consists of questions about only Facebook, in this study it is extended to include other famous social networking sites such as Twitter, Google Plus, Linkedin, Myspace, and Instagram. Hocam.com is added to the options of the survey since it is the most visited university social networking web site in Turkey (Hocam.com, 2005).

Two additional questions are included in the survey; one of them is about the friendship information of students in social networking sites, and the other one is about the friendship information of students across IS100 sections. These questions are important while forming the group since it is aimed to create groups where students do not know each other. The pre-study survey is given in Appendix A.

3.1.2. Group Study on Online Platform

After the pre-study survey is conducted among the students, the answers are analyzed to form the online groups. The groups are formed based on the personality scores of the students. The scores for each trait (Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience) are calculated. Since the study is conducted on an online platform, the biases caused by the students' access to METU-Online are tried to be minimized. For example; even though the students in a group have similar personality, their access to METU-Online may be very different (some may have limited or no forum use experience), and this situation may cause problems when studying together; the students who are not familiar with METU-Online may not respond on time while the other group members that are experienced with the platform may wait for that particular student to respond. In order to minimize these problems, the students' access information to METU-Online is also considered while forming the groups. METU-Online has a feature which shows the platform use statistics of each student. The information is exported from METU-Online; and the students who access to METU-Online in similar frequency are tried to be assigned to the same group.

As aforementioned, the main aim of the study is to form homogeneous and heterogeneous groups based on personality traits. For all students who filled the first survey consistently, their personality scores are calculated. In homogeneous groups, the personality scores of the students should be similar. Hence the homogeneous groups are formed in a way that the difference between the scores of the students should not be greater than 1.5. For example; if a student has 7 points for Extraversion, and the other student has 5 points for the same trait, then the group they are assigned to is not considered as a homogeneous group on Extraversion trait. If such a situation exists, the group is considered as a heterogeneous group. The reason for selecting the range as 1.5 is that in the study of Gosling et al. (2003) the standard deviation for each personality trait is calculated above 1. It means that when the score changes as a standard

deviation, the level also changes. For example; the mean of a trait plus standard deviation specifies a level ("Medium High" level) whereas the mean of a trait minus standard deviation specifies another level ("Medium Low" level). In the study, it is selected as 1.5 for easiness. If it was selected as 1, forming homogeneous groups would be very difficult because of the small range.

The size of the groups is determined as three. In case a member drops out the study, the remaining two members can continue to study together and they can be also considered as a group. As a total, 113 groups are formed.

The group diversity is calculated for determining the level of heterogeneity of groups. It is calculated as in the study of Pieterse et al. (2006) with the following formula:

$$f(K_i) = \begin{cases} 0 & if\ all\ group\ members\ have\ the\ same\ preferences\ in\ dimension\ i \\ 1 & if\ all\ but\ one\ group\ member\ has\ the\ same\ preference\ in\ dimension\ i \\ 2 & otherwise \end{cases}$$

$$Group\ Diversity = \sum_{i=1}^{5} f(K_i)$$

The only difference here is the number of dimensions. Since Pieterse et al. (2006) use Keirsey Temperament Sorter as a measurement of personality; there are 4 dimensions in the formula of their study. In this study, there are 5 dimensions which are Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness. Also, they used this formula for forming small groups which is suitable to this study because in this study the groups are selected as small (maximum 3 members).

In the study if the group diversity is equal to zero, that group is considered as a homogeneous group because it means that all members in the group have similar scores on all traits (i.e. the difference between maximum score and minimum score of the group members is less than or equal to 1.5 as discussed above). If group diversity is greater than zero, the group is considered as a heterogeneous group.

We also wanted to check whether this formula gives consistent diversity values for our data set according to the variation of the groups. The variation of the trait scores for each group is calculated. Then, total variation value is calculated for each group by summing all variation values of the trait scores (variation of Extraversion + variation of Agreeableness + … + variation of Openness). Two examples of this calculation can be seen in Table 1.

Table 1: The example of the calculation of total variance

Ext. Var.	Agr. Var.	Con. Var.	Emo. Sta. Var.	Open. Var.	Total Var.
0.06	0.06	0.00	0.50	0.39	1.00
2.25	4.00	2.25	1.00	0.56	10.06

Var. : Variance

Then the average of total variance values in each diversity group (diversity = 0, diversity = 2 etc.) is calculated. As it can be seen from Table 2, while the diversity values increase, total variance values increase, too. For example, if the total variation of a group is below 1, then the diversity is equal to 0 which means that the group is homogeneous. As discussed the total variation is calculated by summing the variances of all trait scores, and if the group variation is below 1 in total, it means the characteristics of the group members are very similar to each other. So the formula gives sensible diversity values for the groups, and it is easy to classify them as homogeneous and heterogeneous based on their diversity values. The histogram of group diversity values can be found in Appendix E.

Table 2: The comparison between diversity values and the average of the variances

Diversity	Number of Groups	Average of Total Variance Values
0	13	.81
2	10	2.17
3	2	3.89
4	8	5.82
5	1	9.89
8	1	10.06

After the groups are formed, in total 13 questions about the topic of "Computer maintenance, security and problem solving" are prepared for the study. For each group an activity which consists of randomly selected 4 questions among these 13 questions is announced on METU-Online platform. These questions are open-ended questions, in each question a problem about computers is given then it is asked the students to give a solution to that particular problem and explain the type of the problem (e.g. software problem, hardware problem, virus problem etc.). The questions are given in Appendix C. The activity published on May 18th, 2013. Four days are given to the students to finish the activity.

The students are only allowed to communicate via the METU-Online forum. This rule is announced with the activity. They have to write their comments, answers etc. to METU-Online forum only. The reason for forcing them to communicate via forum is to observe their behaviors when studying together, to analyze the number and content of messages that each student sent, and also to help them when there is a problem. Their posts are visible to only their group members.

If one or two members do not respond to the messages sent in the forum, the remaining group members are replaced with the students in the other groups. This replacement is made from the end of the second day to the last day of the study if the group has not started to work yet. Since the study is published on weekend (Saturday afternoon), it is waited for the students to post in forum at the end of the first weekday (Monday). Depending to the students' requests, the replacements continue until the last day of the study. When replacements are made, the procedure for switching is as following:

- If only a single student is not active in the Group A, the student who does not receive any respond from any of his/her group members in the Group B is assigned to the Group A. As a result we want to ensure that each group is well-formed.
- If two members are not active in the Group A, the active student in the Group A is assigned to the Group B which comprises only one student.

Despite the procedure given above, several groups are remained as comprising two members. The reasons are several. One member responds at first, but he/she does not respond towards the end of the study, and it is too late to switch a member because the other groups work well

together. Another reason is that in order to keep groups homogeneous, and there is no student to add that specific homogeneous group without ruining the characteristic of the group, they are kept as two membered on purpose. Because of given problems, some students remained left as one-membered and they had to finish the activity by themselves but they are not counted as a group. The final version of the groups is given in Appendix D.

3.1.3. Post-Study Survey

The post-study survey is conducted among the students who participated in the online study. In this survey, the questions about identifying the most influential students in each group are asked. In order to identify the influential students, the question is asked as "Please rate your group members according to their participation/influence when making a decision in the study. Rate each group member between 1 and 3 where 1 implies the most influential and 3 is the lowest influential member." This question is adapted from Deuling et al. (2011), where they used a similar question for identifying the influential students in a group. Besides this question; the satisfaction about studying together with group members, the familiarity with group members are asked.

In the post-study survey, there are questions about the online platform METU-Online. The students answer the questions about the usefulness, and ease-of-use of METU-Online. We also asked them whether there are other platforms they use during the study such as another chat program or e-mail. Since in the beginning of the study they are forced to communicate only on METU-Online forum, it is essential to know that the forum is sufficient for communication.

For the test-retest reliability of TIPI scale, in the post-study survey TIPI items are asked again to students. The most appropriate reliability measure of TIPI scale is test-retest reliability, so 10 items are asked in the post-study survey to determine the test-retest reliability (Gosling et al., 2003). The post-study survey is given in Appendix B.

3.2. Pilot Study

After the initial design is completed for the study, a small sample of the students is selected for the pilot study. The purpose of the pilot study is observing the main problems that may happen

during the main study, and taking necessary precautions. The announcement is made to 4 IS100 face-to-face classes, and totally 28 students participated to the pre-study survey.

In order to measure the reliability of TIPI scale, Cronbach's Alpha is calculated for each personality trait. The values are .51, -1.38, -.40, -.46, .62 for Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness respectively. It is clearly seen that there is a problem with Agreeableness, Conscientiousness, and Emotional Stability items. When the answers of the students are examined, it is seen that for these 3 traits they gave high rankings both on direct and reverse items. For example; for Agreeableness most of the students give 7 (which means "Strongly Agree") for both "Critical, quarrelsome" and "Sympathetic, warm". In other words, the students claim that they are quarrelsome but also sympathetic persons. The problem is caused by the translation of the items, and by cultural differences. In order to prevent encountering the same problem in actual study, explanations for the items are added in the pre-study survey. The last version of the items can be seen in Appendix A.

When the pilot groups studied together on online platform, some students dropped the study so 1 student left in 2 groups. The switching procedure given in Section 3.1.2 is developed after the pilot study. Hence, the number of students who remain left is tried to be minimized.

There is not another problem encountered during the pilot study. In total 4 groups (14 students) completed the activity in the pilot study. After the precautions taken, the study is announced to all IS100 students.

CHAPTER 4

DATA ANALYSIS

In this chapter, the data analysis of the study is described. Firstly, the initial results are given. Secondly, how outliers are detected and eliminated from data set is described. Thirdly, the test-retest reliability of TIPI scale is given. Then, it is showed that the group study is not biased depending on the former grades of students. Lastly, the hypotheses of the study are given and the methods for testing the hypotheses are described.

4.1. Initial Results

Totally 474 results were obtained from the first survey. 31 of the participants filled the survey more than once (duplicates) so their answers were removed. The more fully-answered survey results of duplicates were kept and the others were deleted. For example; in one of the results the student specified his/her friends additional to the other information in the survey but in other result he/she didn't. The one where the student did not write his/her friends' names was removed from the whole result set. If there was no additional information between the two answers, the one which was filled the latest was kept. After removing the duplicates, 439 results were left.

Since the purpose of the study is to group the students based on their personality traits, TIPI questions are the most important questions in the survey. The missing data in these questions is not acceptable. 16 participants did not answer TIPI questions so they were eliminated.

96 of the participants were not the students of IS100 course. Their answers were also removed. Totally 327 results were left. The descriptive statistics of the TIPI scale results are given in Table 3.

Table 3: Descriptive Statistics for TIPI Items (N=327)

Item	Min	Max	Median	Mean	SD	Cronbach's Alpha
1.Extraverted, enthusiastic	1.00	7.00	6.00	5.19	1.59	
6.Reserved, quiet	1.00	7.00	2.00	2.75	1.66	
2.Critical, quarrelsome	1.00	7.00	4.00	3.95	1.79	
7.Sympathetic, warm	1.00	7.00	6.00	5.66	1.40	
3.Dependable, self-disciplined	1.00	7.00	6.00	5.50	1.37	
8.Disorganized, careless	1.00	7.00	4.00	3.81	1.93	
4.Anxious, easily upset	1.00	7.00	4.00	3.75	1.75	
9.Calm, emotionally stable	1.00	7.00	5.00	4.65	1.67	
5.Open to new experiences, complex	1.00	7.00	6.00	5.21	1.38	
10.Conventional, uncreative	1.00	7.00	2.00	2.65	1.58	
Total Scores						
Extraversion	1.00	7.00	5.50	5.22	1.41	.69
Agreeableness	1.00	7.00	4.50	4.86	1.16	.08
Conscientiousness	1.00	7.00	5.00	4.84	1.36	.48
Emotional Stability	1.00	7.00	4.50	4.45	1.33	.37
Openness to Experience	1.00	7.00	5.50	5.28	1.22	.51

Gosling et al. (2003) specified acceptable Cronbach's alpha values in TIPI as .68, .40, .50, .73, and .45 for Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience scales respectively. Comparing to their study, the Cronbach's alpha values for Extraversion, Conscientiousness, and Openness to Experience are acceptable in our study. The alpha of Agreeableness is very low and not acceptable, of Emotional Stability is also low. The outlier analysis is performed to increase the internal consistency and data quality.

Also correlations among TIPI items were investigated for the reliability of the scale (Gosling et al., 2003). The Pearson correlation coefficient was used. The results are in Table 4. As it can be

seen from the table, there is no correlation between Agreeableness items. Also the correlation between Emotional Stability items is lower than other items' correlation. Again it can be seen that those are the problematic items.

Table 4: The correlations among the TIPI Items (N=327)

	Extraversion		**Agreeableness**		**Conscientiousness**		**Emotional Stability**		**Openness**	
	Item1	Item6	Item2	Item7	Item3	Item8	Item4	Item9	Item5	Item10
Item1	-									
Item6	**-.52****	-								
Item2	.15**	.07	-							
Item7	.58**	-.33**	**-.04**	-						
Item3	.35**	-.12*	-.05	.39**	-					
Item8	-.08	.11*	.05	-.02	**-.33****	-				
Item4	-.08	.28**	.05	-.07	-.02**	.26**	-			
Item9	.16**	.00	.00	.25**	.29**	-.22**	**-.22****	-		
Item5	.44**	-.30**	.07	.41**	.28**	-.05	-.02	.20**	-	
Item10	-.30**	.35**	-.02	-.17**	-.19**	.20**	.10	.00	**-.35****	-

**. Correlation is significant at the .01 level

*. Correlation is significant at the .05 level

4.2. Outlier Analysis

In order to detect the outliers several methods can be used (e.g. box plots, scatter plots, trimmed mean). In this study the outliers were checked with scatter plots. For each trait's items, the scatter plots were drawn, the plots are in Appendix F. In TIPI scale, for each trait one item measures the trait directly, and the second one measures the trait reversed. So the responders who rate both items of a trait equally generate the outliers. For example; if a participant gives score 1 (Strongly Disagree) to both "Extraverted, enthusiastic" and "Reserved, quiet", it means that there is an inconsistency on the answers of that participant. His/her answers affect the internal consistency of the survey so the answers of him/her should be eliminated in order to increase the internal consistency of the survey. On the other hand, a participant can rate both

items as 4 (Neutral). That answer does not generate an inconsistency because logically there is not a problem.

By analyzing the scatter plots and the answers of participants, the answers which consisted of the same scores at the edge points (e.g. score 1 or 7 for both items of a trait) were eliminated from the data set. After eliminating the outliers, 208 data points were left. After the outlier detection and removal, the correlations among items and Cronbach's alphas were re-calculated. The updated descriptive statistics are shown in Table 5.

Table 5: The descriptive Statistics of the results of the TIPI Items after performing the Outlier Analysis (N=208)

Item	Min	Max	Median	Mean	SD	Cronbach's Alpha
1.Extraverted, enthusiastic	1.00	7.00	5.00	5.18	1.41	
6.Reserved, quiet	1.00	7.00	2.00	2.73	1.54	
2.Critical, quarrelsome	1.00	7.00	4.00	3.58	1.56	
7.Sympathetic, warm	1.00	7.00	6.00	5.55	1.34	
3.Dependable, self-disciplined	1.00	7.00	6.00	5.37	1.29	
8.Disorganized, careless	1.00	7.00	3.00	3.45	1.72	
4.Anxious, easily upset	1.00	7.00	3.00	3.51	1.60	
9.Calm, emotionally stable	1.00	7.00	5.00	4.61	1.60	
5.Open to new experiences, complex	1.00	7.00	5.00	5.14	1.26	
10.Conventional, uncreative	1.00	7.00	2.00	2.50	1.38	
Total Scores						
Extraversion	2.00	7.00	5.50	5.16	1.29	.71
Agreeableness	1.00	7.00	5.00	4.93	1.20	.52
Conscientiousness	1.00	7.00	5.00	4.95	1.37	.73
Emotional Stability	2.00	7.00	4.50	4.50	1.36	.64
Openness to Experience	1.00	7.00	5.50	5.30	1.12	.63

The Cronbach's alpha values except the Emotional Stability are above the values in the study of Gosling et al. (2003). But its alpha value is the third highest value; the lower ones are accepted

according to Gosling et al. (2003). Hence they are reasonable, another pre-processing is not required.

It is stated that alpha value should be higher than .70 for reliability (Nunnally, 1978). However, Gosling et al. (2003) specifies that the alpha values for TIPI scale are not high and for testing the reliability of TIPI scale Cronbach's alpha does not give appropriate results. Nevertheless, the values obtained from data set are not far from the ones in the study of Gosling et al. (2003).

Table 6: The correlations among TIPI Items after Outlier Analysis (N=208)

	Extraversion		**Agreeableness**		**Conscientiousness**		**Emotional Stability**		**Openness**	
	Item1	Item6	Item2	Item7	Item3	Item8	Item4	Item9	Item5	Item10
Item1	–									
Item6	**-.55****	–								
Item2	-.06	.05	–							
Item7	.50**	-.25**	**-.35****	–						
Item3	.34**	-.12	-.16*	.33**	–					
Item8	-.19**	.07	.07	-.12	**-.60****	–				
Item4	-.19**	.23**	.09	-.15*	-.26**	.23**	–			
Item9	.22**	-.08	-.16*	.31**	.35**	-.27**	**-.47****	–		
Item5	.43**	-.33**	-.04	.34**	.22**	-.15*	-.15*	.261**	–	
Item10	-.38**	.40**	.05	-.28**	-.27**	.20**	.17*	-.10	**-.46****	–

**. Correlation is significant at the .01 level

*. Correlation is significant at the .05 level

When Table 4 and Table 6 are compared, it can be seen that correlation coefficients between the items of all traits are increased. Especially for Agreeableness, the previous correlation was not significant, and the coefficient was -.04; after performing the outlier analysis it increased to -.35, and the correlation is now significant at the .01 level.

4.3. Test-Retest Reliability

The most appropriate reliability measure for TIPI scale is test-retest reliability (Gosling et al., 2003). Accordingly, in the post-survey the TIPI items were included as in the pre-survey. Thus the results of the first survey results and the second one can be compared to assess the test-retest reliability.

Among 208 students 97 of them filled the post-survey 2 weeks later. The test-retest reliability is measured with the Pearson correlation between the first and second scores of the students for each trait. The scatter plots are given in Appendix G. The results are as follows:

Table 7: Test-Retest Reliability for TIPI Scale (N=97)

	Test-Retest Reliability
Extraversion	.82
Agreeableness	.69
Conscientiousness	.78
Emotional Stability	.68
Openness to Experience	.65

Gosling et al. (2003) found that the test-retest reliability as .77, .71, .76, .70, .62 as acceptable for Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness to Experience respectively. Comparing to their results the test-retest reliability of the survey is acceptable. The reliability of Extraversion, Conscientiousness and Openness is above the ones in Gosling et al. (2003), of Agreeableness and Emotional Stability is below but very close to their findings.

After eliminating the outliers, some of the group members should be eliminated. When determining the final number of groups, the below criteria is implemented. The final group table is given in Appendix D.

- If the group has 3 active members:
    - If 3 or 2 members of the group are identified as outliers, the group is removed (As in discussed in Chapter 3, a group should have a minimum of two members).
    - If 1 member of the group is identified as an outlier, the remaining 2 members are counted as 2-member-group.
- If the group has 2 active members and at least one of them is identified as an outlier, the group is discarded.

4.4. Checking Biases

The aim of the study is to investigate whether the personality of the students affects the group study success or not. Accordingly the homogeneous and heterogeneous groups are formed. An activity which consists of 4 questions given in Appendix C is assigned to each group which requires them to work in a collaborative way. The grades that the groups received from the activity are considered as a group success.

The participants of the study are the students of IS100 course. Before the study conducted, their midterm and assignment grades are determined. This study is based on a group work and they have to answer the questions in a limited period of time. So it can be considered as another assignment for the course.

We check whether the successful students before this study are also successful at group work. If the students who get high grades from the regular assignments also get high grades from the group work, the effect of personality cannot be measured effectively. In order to test the relation between the assignment grades and the group study grades, the Pearson Correlation is used. The scatter diagram of the group grades and the average assignment grades can be seen in Figure 6. The Pearson Correlation Coefficient between the two is calculated as .08 ($N=84$, $p=.47$). The result shows that there is a very low correlation between the group grades and the average of the assignment grades.

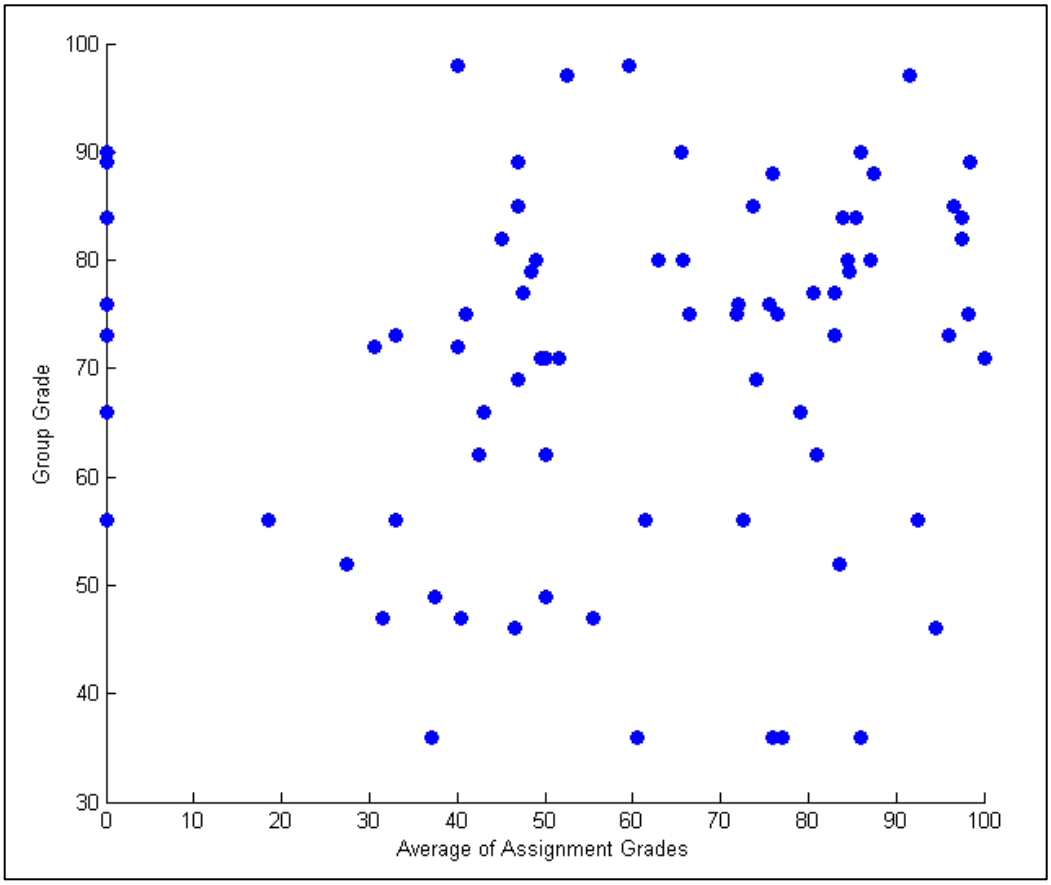

Figure 6: The scatter Diagram between the Group Grade and the Average of Assignment Grades

It can be said that the group grades are not dependent on the previous assignment success of students. It is desirable since the purpose of the study is to measure the personality effects on group success. It is important that the group success is not dependent on other factors such as the previous success of students.

We also tested the difference between the personality scores of the students who participated to the study and who did not. It is desirable that the mean of trait scores of both the participants and non-participants would be equal. First, the boxplots for each class (participant and non-participant) and for each trait are drawn. They can be seen in Appendix H. It can be observed that for Extraversion and Conscientiousness traits there is an apparent difference. The descriptive statistics are given in Table 8. The mean differences for Extraversion and Conscientiousness traits can also be seen for participants and non-participants from the table.

Even though the medians for Openness are not different from each other for participants and non-participants, there is a slight difference for means. Of course, in order to identify whether these differences are significant, an appropriate statistical test should be performed.

Table 8: The Descriptive Statistics for the Trait Scores of Participants and Non-Participants

		N	**Min**	**Max**	**Median**	**Mean**	**Std. Dev.**
Extraversion	Non-Participant	126	2.50	7.00	5.75	5.45	1.26
	Participant	82	1.50	7.00	5.00	5.06	1.30
Agreeableness	Non-Participant	126	1.00	7.00	5.00	5.06	1.33
	Participant	82	2.50	7.00	5.00	4.95	1.16
Conscientiousness	Non-Participant	126	1.00	7.00	5.50	5.19	1.38
	Participant	82	2.00	7.00	5.00	4.82	1.31
Emotional Stability	Non-Participant	126	1.00	7.00	4.50	4.51	1.38
	Participant	82	1.50	7.00	4.50	4.53	1.41
Openness	Non-Participant	126	1.00	7.00	5.50	5.56	1.12
	Participant	82	2.00	7.00	5.50	5.19	1.17

Before testing the difference, normality of data should be checked. For all traits, the scores of the students are tested for normality with Kolmogorov-Smirnov Test and Shapiro-Wilk Test. The results obtained from these tests are given in Table 9. According to the Kolmogorov-Smirnov and Shapiro-Wilk test results, the significance values are lower than .05, so it can be said that the data is not normally distributed. The histograms of the data are given in Appendix I. When looking at these histograms, again it can be seen that the data is not normally distributed.

Since the data is not normally distributed, it is not suitable to perform t-Test. Instead of t-Test, Mann Whitney U Test can be performed for the data which is not normally distributed. The results of the Mann Whitney U Tests for each trait can be seen in Table 10. According to these results, there is a significant difference between the scores of participants and non-participants for Extraversion ($p = .03$), Conscientiousness ($p = .04$), and Openness ($p = .02$).

Table 9: The Result of the Normality Tests for the Trait Scores of the Students

	Kolmogorov-Smirnov			Shapiro-Wilk				
	Statistic	df	Sig.	Statistic	df	Sig.	Skewness	Kurtosis
Extraversion	.14	208	.00	.94	208	.00	-.553	-.388
Agreeableness	.10	208	.00	.96	208	.00	-.364	-.339
Conscientiousness	.12	208	.00	.96	208	.00	-.312	-.592
Emotional Stability	.10	208	.00	.97	208	.00	-.185	-.697
Openness	.13	208	.00	.94	208	.00	-.759	.493

Table 10: The Results of the Mann-Whitney U Tests for the Trait Scores

	Ext.	**Agr.**	**Con.**	**Emo. Sta.**	**Open.**
Mann-Whitney U	4253.00	4737.50	4293.00	5165.00	4163.00
Z	-2.17	-1.02	-2.07	-.00	-2.39
Asymp. Sig. (2-tailed)	.03	.31	.04	.10	.02

It can be concluded that for 3 of 5 traits there is a bias for participants and non-participants. The participants are higher on Extraversion than non-participants. In fact, it is an expected result since extraverts like the activities in which they can communicate with others. Also, according to the results high conscientious students tend to participate to the study. It is also an expected result since conscientious students are self-disciplined and organized, i.e. they care their grades more than low conscientious students. It is interesting that the students low on openness prefer participating to the study more than the students high on openness. High openness leads participating different activities but in this study it is vice versa. It may be caused by other factors. For example; since the activity is bonus-rewarded, the students who needed extra points for the course may have participated to the study, and by chance their characteristics may not be high on Openness.

The existing bias may have an effect on the analysis. Since more extraverts, more conscientious and less open students participated to the study, the relation between personality characteristics and group success may not be observed clearly.

4.5. Hypotheses Testing

In this subsection, the hypotheses according to our research questions are tested. Since many different aspects of the students are determined by pre and post surveys, the effects of personality traits are investigated not only on group success but on influence in groups, group communication, social media use etc. Hence, the hypotheses are split into 4 categories: Hypotheses about Personality and Group Success, Hypotheses about Personality and Online Communication, Hypotheses about Influence in Online Groups, and Hypotheses about Personality and Social Media Use.

4.5.1. Hypotheses about Personality and Group Success

It is mainly investigated throughout the study whether the personality types of students in groups affect the group success or not. Accordingly, the homogeneous and heterogeneous groups were formed. When they finished their study, each group's performance was determined by grading their activity files. Inspired from the previous studies in literature such as Peeters et al. (2006), Pieterse et al. (2006), Hórreo, and Carro (2007) the following hypotheses were developed:

Hypothesis 1: There is a difference between the success of homogeneous and heterogeneous groups.

In order to compare the group type and group success, the group diversity mentioned in Chapter 3.1.2 was used. If the diversity of a group is equal to zero, it means that it is a homogeneous group. Otherwise, the group is considered as heterogeneous. The purpose of using diversity is to observe whether there is a relationship between group success and group diversity. The diversity information tells whether a group is homogeneous or heterogeneous and also if it is a heterogeneous group, it gives an idea about the degree of heterogeneity. Firstly, the effect of the homogeneous and heterogeneous groups is investigated on the group success. The descriptive statistics for the homogeneous and heterogeneous groups are presented in Table 11.

Table 11: The Descriptive Statistics for the Group Grades of the Homogeneous and Heterogeneous Groups

	Hom.	Het.
Number of groups	13	22
Min. grade	36.00	36.00
Max. grade	84.00	98.00
Median of grades	73.00	79.50
Mean of grades	67.46	73.95
Std. dev. of grades	14.65	17.23

The mean of the grades for the homogeneous and heterogeneous groups is different from each other but in order to say that this difference is statistically important, the statistical tests should be performed. Before performing the statistical tests, it should be known whether grades are normally distributed or not. For that purpose, Kolmogorov-Smirnov Test and Shapiro-Wilk Test are performed on the grades. The results of the tests and skewness-kurtosis values are shown in Table 12.

Table 12: The Result of the Normality Tests for the Group Grades

	Kolmogorov-Smirnov			Shapiro-Wilk				
	Statistic	df	Sig.	Statistic	df	Sig.	Skewness	Kurtosis
Group Grade	.14	35	.06	.95	35	.10	-.595	-.381

According to the Kolmogorov-Smirnov and Shapiro-Wilk test results, the significance values are higher than .05, so it can be said that the data is normally distributed. According to Razali, and Wah (2011) Shapiro-Wilk Test is the most powerful test for testing normality, so its results are considered. Also the skewness and kurtosis values are close to zero which also shows the normality of the data. The histogram and Q-Q plot of the data set are also drawn, and they can be seen in Appendix J.

Since the data set is normally distributed and there are 2 groups for testing the difference, t-test can be used. Before performing t-test, Levene's Test for Equality of Variances should be performed, and then the results of t-test should be interpreted upon the results of Levene's Test.

As a result of Levene's Test, F value is calculated as .99, and the significance is .33 which means the variances of both groups (homogeneous and heterogeneous) are equal.

T-test is performed with selecting significance level as .05. The results of t-test are given in Table 13. It shows that t value is equal to -1.14, and the significance is .26 which is much higher than .05. So it can be said that there is no difference between the mean of grades for homogeneous and heterogeneous groups. The hypothesis is not supported.

Table 13: The results of T-test for the Group Grades of Homogeneous and Heterogeneous Groups

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Group Grade	-1.14	33	.26	-6.49	5.72	-18.12	5.14

In order to deeply analyze the effect of diversity on the group grades, data mining techniques are used. We aim to find whether there are any other indicators on group success other than personality differences such as gender or faculty information etc.

The plot of the group diversity score and the group grades is given in Figure 7. The ones which have the diversity scores equal to zero represent homogeneous groups, and the others represent the heterogeneous ones. It can be seen that the grades of the homogeneous groups are mostly between 65 and 85. There are 3 points only which do not fit into this situation. When these three points are analyzed, we observe that the ones which obtained grades equal to 46 and 49 comprise the students whose faculties are at social sciences. This observation gives us a clue about if the faculty of the students are also important (or more important) on the group success as well as the personality traits. The other group which received 36 consists of the students whose access to METU-Online platform is equal to zero before beginning to the study. The reason why they had a low grade may be that they were not familiar with the platform and they did not study effectively on that platform.

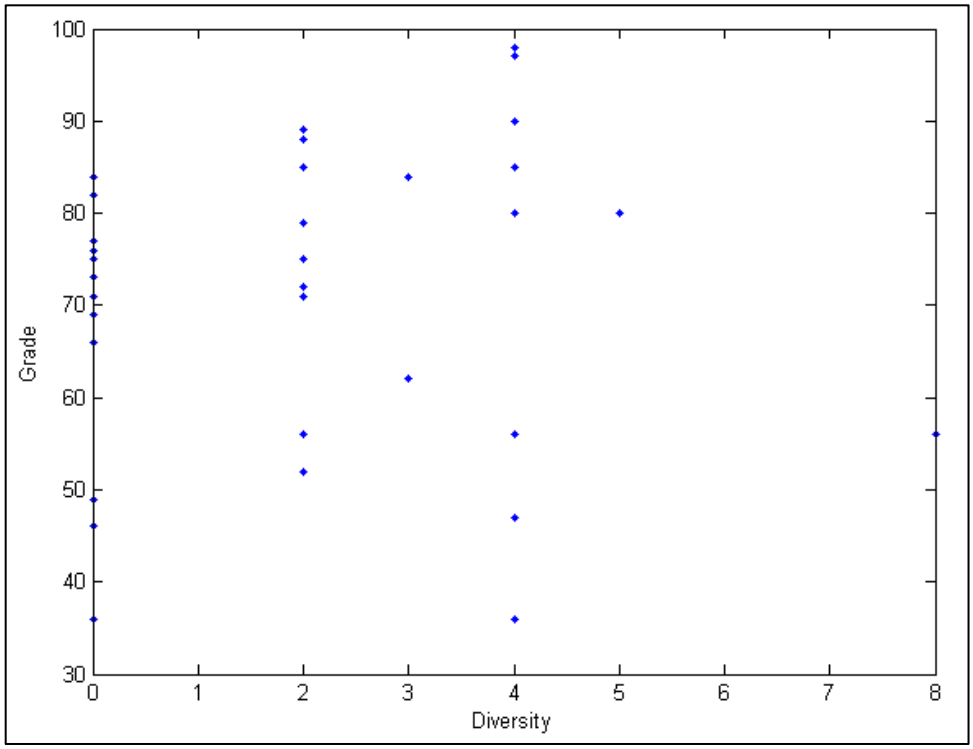

Figure 7: Group Diversity and Grade

As a consequence, we decided that it should be better other factors such as faculty, gender, and total active study days should be also included in the experiments in addition to the diversity scores of the groups.

The information about gender, faculty, and total studying days are added to be analyzed. The most and least effective factors should be determined, so it is best to construct a decision tree upon these factors because decision trees give the hierarchical decision pattern. If an attribute is at the higher level of the decision tree, it means that it is more important than other attributes to classify the data.

Before constructing the decision tree, the information about these factors is organized. The gender information is added in a way that it shows the number of male and female students in a group. There are totally 7 combinations as shown in Table 14. In the table, it is also shown how many groups satisfy each combination. For example; there are 5 groups which contain no male students, and 3 female students. The class label column shows each combination's label. The

reason of giving the Class 5 label to the last 3 combinations is that the number of the data points in these combinations is insufficient. Also, merging makes sense since all 3 combinations consist of mostly male students. With merging 3 combinations, a class with 4 data points (Class 5) is obtained so that over-fitting caused by insufficient data points on decision tree is tried to be minimized.

Table 14: The Gender Combinations in the Groups and Class Labels

Number of Male Students	Number of Female Students	Number of Groups Satisfy Combination	Class Label
0	3	5	1
0	2	4	2
1	2	5	3
1	1	17	4
2	1	1	5
2	0	2	5
3	0	1	5

The faculty information is also classified in a similar fashion. This time, the numbers show whether the group students are social science students or natural science students in Table 15. Again, the first 2 combinations are merged together due to insufficient number of data points in the first combination. When the combinations are studied, merging these two appears to make sense since they consist of only natural science students. No class label is assigned to the last combination because there is no group comprising 3 social science students. After those arrangements, 5 classes are obtained for both the gender and the faculty information of the groups.

Table 15: The Faculty Combinations in the Groups and Class Labels

Number of Social Science Students	Number of Natural Science Students	Number of Groups Satisfy Combination	Class Label
0	3	1	1
0	2	10	1
1	2	8	2
1	1	9	3
2	1	4	4
2	0	3	5
3	0	0	-

The total active study days are determined by analyzing the forum messages of the students. Since the students use forum to communicate and discuss the solutions, the number of days they have studied on the activity questions are easily determined. For example; if a group chooses to share the questions among the group members, and one member posts his/her answers on day 1, the other ones post day 2; the number of study days is determined as two because it is two days spent for answering all the questions. If they make a correction after postings, those days are also counted.

The decision tree is fitted on MATLAB, and the functions of MATLAB uses CART (Classification and Regression Tree) algorithm. The type of the tree (Classification or Regression) is selected depending on the target variable. If the target variable is a categorical data, the decision tree is a Classification Tree. If the target variable is continuous, then the tree is called as Regression Tree. CART algorithm uses Gini Impurity (i.e. Gini Index) when splitting the nodes in both classification and regression trees. In this study, the target value (group grades) is a continuous variable, so the decision tree is constructed as a regression tree. In regression trees splitting is done in an iterative way. The algorithm splits data into partitions in such a way that in each split it tries to minimize the sum of squared deviation. (Breiman, Friedman, Olshen, & Stone, 1984)

The function RegressionTree.fit(x, y) is used in MATLAB. The input variables are Gender, Faculty, Active Study Days, and Diversity (x vector). The output (target) variable is Grade (y vector). The parameters of the function are set as follows:

Categorical Predictors = Gender, Faculty
MinLeaf = 3

The Gender and Faculty variables are introduced as categorical because a classification was carried out before. The MinLeaf shows the minimum number of observations each tree leaf has got. By default, it is equal to 1 but it leads over-fitting for the tree. The tree is forced to be split for only 1 observation. It is selected as 3 (10% of total observations) because it is a reasonable number when considering the fact that the total number of observations is 35. The tree constructed by function is shown in Figure 8.

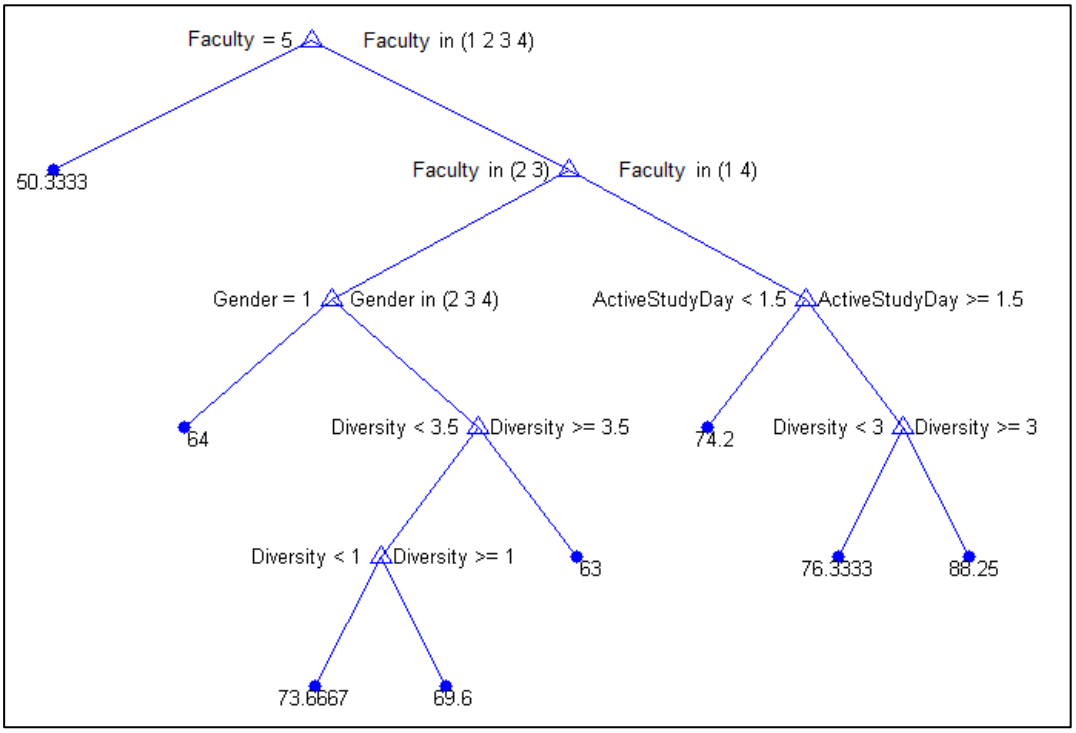

Figure 8: The Constructed Regression Tree

The rules of the tree can be interpreted as follows:

- If the group consists of only 2 social science students (Faculty Class 5), then the group grade is predicted as 50.33.
- If the group consists of 2 or above natural science students (Faculty Class 1), or 2 social and 1 natural science students (Faculty Class 4), and the active study day of group is less than 1.5, then group grade is predicted as 74.2.
- If the group consists of 2 or above natural science students (Faculty Class 1), or 2 social and 1 natural science students (Faculty Class 4), and the active study day of group is greater than or equal to 1.5, and the diversity is less than 3, then the group grade is predicted as 76.33.
- If the group consists of 1 social and 2 natural science students (Faculty Class 2), or 1 social and 1 natural science students (Faculty Class 3), and consists of 3 female students (Gender Class 1), then the group grade is predicted as 64.

- If the group consists of 1 social and 2 natural science students (Faculty Class 2), or 1 social and 1 natural science students (Faculty Class 3), and consists of only 2 female students (Gender Class 2), or 2 female and 1 male students (Gender Class 3), or 1 female and 1 male students (Gender Class 4), and the diversity of group is greater than or equal to 3.5, then group grade is predicted as 63.
- If the group consists of 1 social and 2 natural science students (Faculty Class 2), or 1 social and 1 natural science students (Faculty Class 3), and consists of only 2 female students (Gender Class 2), or 2 female and 1 male students (Gender Class 3), or 1 female and 1 male students (Gender Class 4), and the diversity of group is less than 1 (homogeneous group), then the group grade is predicted as 73.67.
- If the group consists of 1 social and 2 natural science students (Faculty Class 2), or 1 social and 1 natural science students (Faculty Class 3), and consists of only 2 female students (Gender Class 2), or 2 female and 1 male students (Gender Class 3), or 1 female and 1 male students (Gender Class 4), and the diversity of group is between 1 and 3.5 (heterogeneous), then the group grade is predicted as 69.6.

When we studied the general structure of the tree, we observed that the first and second splits are based on the Faculty variable which means the faculty of the students affects group grades mostly. Then the active number of study days, and the gender become effective; the diversity has lower effect on the grades than others. When considering only diversity and grades, there is a weak relation because there are other factors such as faculty which affect group success more than diversity.

From the first split, it is apparent that the grade of the groups consists of only social science students is 50.33 on average. The two of the groups are homogeneous ones, and they are the ones which decrease the average grade of the homogeneous groups. It is seen again that the faculty factor is more significant than the personality factors. When it is looked at the second split, it is hard to explain it. Because the algorithm splits the groups in such a way that the groups consist of both mostly natural science students, and 2 social – 1 natural science students are in the same branch. In order to analyze this split, the forum communication of the students is investigated. It is seen that the groups which are in Class 2 and 3, mostly completed the study in 1 day or less. The other groups which are in class 1 and 4 studied on the activity more (there are

groups which completed in 2 or 3 days). So in this branch the next split is about study day of these groups. Since there is no distinction on study day of the groups in Class 2 and 3, these groups are separated from others. When it is looked at this split only, it is hard to explain but with deeper levels it becomes meaningful.

In deeper nodes, it can be seen that the groups studied on the activity less than 1.5 days get lower grades than the ones which spent more than 1.5 days. In the last node of the grade split-branch, the groups which have diversity less than 1 (it means the diversity is equal to 0, i.e. homogeneous groups) are more successful than the ones which have diversity greater than or equal to 1 (i.e. heterogeneous groups). So the hypothesis developed at first is partially true; the group success is affected by the other factors first but the diversity has also an impact. Some of the previous studies such as Pieterse et al. (2006) show that the diversity is a strong predictor on group grades. But in some studies such as Peslak (2006) it is found that diversity is not an important factor on IT team success. It can be concluded as the context changes the effects of group diversity can also change. With this study, it can be also seen that the effect of diversity is dominated by other factors.

In order to calculate the error of the tree, cross-validation is applied. As a cross-validation type leave-one-out cross-validation (LOOCV) is used because of the limitation of the data set size. LOOCV uses a single observation from the training data as the validation data, and others are remained as training data. Each data point in training data set is used in LOOCV. In MATLAB using kfoldLoss(t) function calculates the error of the tree by using selected type of cross-validation. Leave-one-out is selected as cross-validation parameter. Here, t is the tree constructed by RegressionTree.fit(x, y) function. The function calculates the mean squared error (MSE) for regression trees. The calculated mean squared error of the tree is 404.37.

The other trees are also constructed with different MinLeaf values to find the tree with minimum error. The calculated error values and their MinLeaf values are given in Table 16 and the graph depending on these values are in Figure 9. It can be seen that the minimum error is obtained when MinLeaf value is equal to 12, 13, and 14. The tree is drawn when MinLeaf is equal to 12, 13, and 14 to be analyzed; it can be seen from Figure 10.

Table 16: The Cross Validation Errors of the Trees with Different MinLeaf Values

MinLeaf	Cross Validation Error (MSE)	MinLeaf	Cross Validation Error (MSE)
1	381.89	19	277.11
2	397.08	20	277.11
3	404.37	21	277.11
4	419.03	22	277.11
5	343.45	23	277.11
6	297.96	24	277.11
7	288.02	25	277.11
8	287.52	26	277.11
9	296.53	27	277.11
10	311.97	28	277.11
11	294.95	29	277.11
12	248.92	30	277.11
13	248.92	31	277.11
14	248.92	32	277.11
15	266.36	33	277.11
16	277.11	34	277.11
17	277.11	35	277.11
18	277.11		

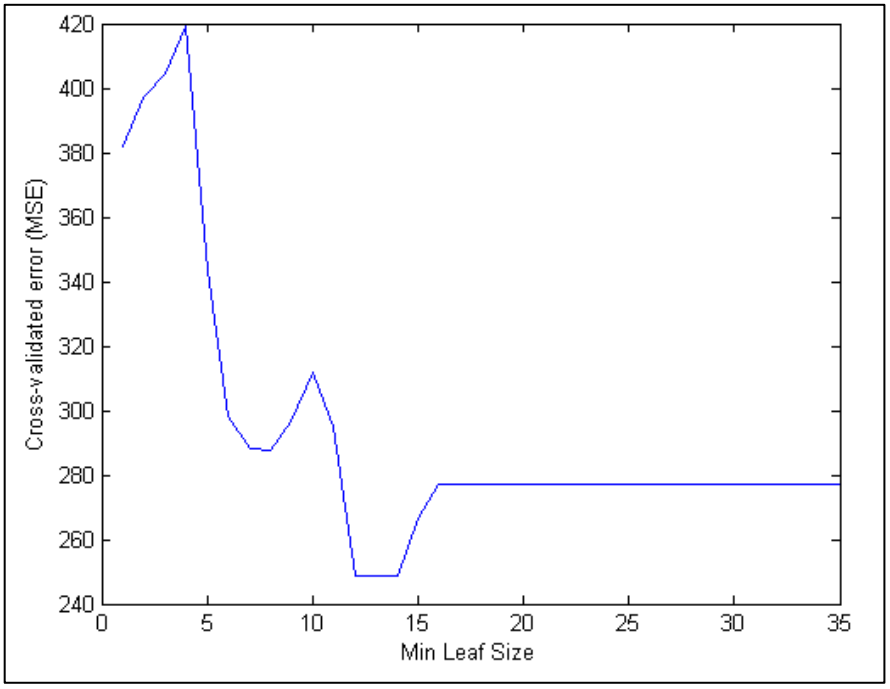

Figure 9: The Cross Validation Errors vs. the MinLeaf Size of the Trees

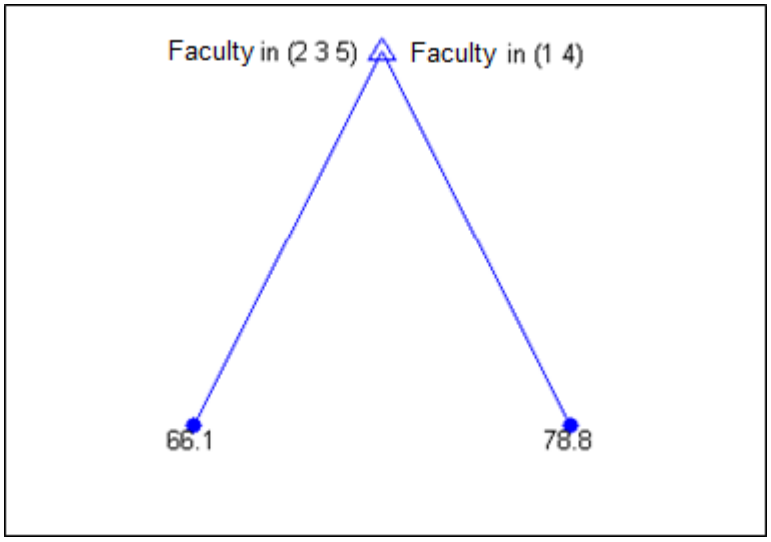

Figure 10: The Decision Tree Obtained when MinLeaf=12, 13, and 14

The tree with the minimum error splits the data set depending on only faculty variable. Again, the groups which contain mostly natural science students and mostly social science students are on the same branch. Although the tree has minimum error, it is hard to explain the split, and it is very small size for comparing the differences among groups. The first tree (when MinLeaf = 3) is more detailed and its splits can be explained by considering the nature of the groups, so it is chosen.

Hypothesis 2: There is a relation between the level of personality trait scores of the students in the group and the group success.

The effects of each personality trait are also investigated on online group success. It is hypothesized that while the average trait score changes on groups, it affects the group success. For example; the groups with the students who have high average Extraversion score may be more successful than the ones with the students who have low average Extraversion scores or vice versa. The number of the high/low scored students may affect the group success.

To analyze the hypothesis, homogeneous groups are used because in homogeneous groups there are students with trait scores not far from each other. As mentioned in previous chapter, as a rule of a homogeneous group, the difference between trait scores of the students must be less

than or equal to 1.5. An average can be calculated for homogeneous groups. On the other hand, in heterogeneous groups there are students with very different trait scores (for example; students with scores equal to 6 and 2.5 may be in the same group). It is meaningless calculating averages for them. Even the average is calculated, it may lead wrong results for analysis.

For each trait, homogeneous groups are determined. The number of groups is different for each trait because heterogeneous groups (diversity > 0) may be homogeneous on some traits. This situation is explained with Table 17:

Table 17: Homogeneous and Heterogeneous Group Example

Ext.	**Agr.**	**Con.**	**Emo. Sta.**	**Open.**	**Diversity**	**Group Type**
Hom	Hom	Hom	Hom	Hom	0	Hom
Het	Het	Het	Hom	Het	4	Het

Hom: Homogeneous, Het: Heterogeneous

In first row of Table 17, an example of a homogenous group is given. Expectedly, for all traits (Extraversion, Agreeableness, Conscientiousness, Emotional Stability, and Openness) the group is homogeneous. In the second row, an example of heterogeneous group is given. This group is considered as heterogeneous because diversity is equal to 4. But when it is looked on each trait's basis, it is seen that this group is homogeneous on Emotional Stability. As illustrated with this example, number of homogeneous groups for each trait differs. In Table 18, descriptive statistics for grades of homogeneous groups on each trait are given.

Table 18: The descriptive Statistics for the Grades of Homogeneous Groups on the Personality Traits

	Ext.	**Agr.**	**Cons.**	**Emo.**	**Open.**
Number of groups	26	25	27	24	26
Min. grade	36.00	36.00	36.00	36.00	36.00
Max. grade	98.00	98.00	97.00	97.00	98.00
Median of grades	73.00	76.00	75.00	73.00	74.00
Mean of grades	70.58	74.40	70.63	69.25	72.46
Std. dev. of grades	16.37	14.35	16.78	16.52	15.64

First, the scatter plots of the personality trait scores and the group grades are drawn in order to analyze whether there is a relation between them. The plots can be found in Appendix K. In those plots, x axis shows average scores of traits, y axis shows group grades. A slight negative correlation can be seen between Emotional Stability and group grades. In order to find out real results, Pearson Correlation Coefficient is calculated for each trait score and group grades. The results are in Table 19.

Table 19: The correlation between the Personality Trait Scores and the Group Grades

	Number of groups	**Pearson Correlation**	**Sig. (2-tailed)**
Extraversion - Group Grade	26	-.13	.52
Agreeableness - Group Grade	25	-.12	.96
Conscientiousness - Group Grade	27	-.34	.08
Emotional Stability - Group Grade	24	**-.47***	.02
Openness - Group Grade	26	.14	.51

*. Correlation is significant at the .05 level (2-tailed).

The results show that there is a negative correlation between Emotional Stability and group grades, and it is significant at the .05 level. It means that the lower the Emotional Stability level the higher the group success rate is. It is consistent with the previous studies in the literature such as in the study of Peeters et al. (2006). It is also observed that the Conscientiousness level is negatively correlated with the group success rate. Even though its significance level is not below .05, it is very close (.08). When comparing other traits, it has the second highest correlation coefficient, and its significance is higher than the ones of Extraversion, Agreeableness, and Openness. It can be said that the most effective trait is Emotional Stability on the group success rate, Conscientiousness is also effective but for the other traits there is no effect on the group success rate.

Since Emotional Stability is found related to group success, we also wanted to investigate whether Emotional Stability scores of male and female students differ from each other. In other words, we wanted to investigate that gender differences are effective on the scores of Emotional

Stability hence also effective on group success. In order to compare the difference Mann Whitney U Test is performed since Emotional Stability scores are not normally distributed (See Section 4.4). According to Mann Whitney U Results, the difference between Emotional Stability scores of male and female students is not statistically significant (N = 82, Mann Whitney U = 672.50, Z = -1.22, p = .22). So gender is not effective on the scores of Emotional Stability for the participants of the study.

4.5.2. Hypotheses about Personality and Online Communication

We investigated whether the forum use of homogeneous and heterogeneous groups differ from each other, and the level of personality trait scores differentiates the online communication. By following the same procedure in Section 4.5.1, two hypotheses are developed for online communication.

Hypothesis 3: There is a difference between the number of forum messages of homogeneous and heterogeneous groups.

Online communication is measured with the number of messages posted to the forum. For each group, the total number of messages (related to the study) is calculated, and then the number is divided by the number of students in the group. Hence, the average number of messages is calculated for each group. The diversity score of the groups was calculated at the beginning of the study (see Chapter 3).

Firstly, in order to have a general idea about the difference between the average number of messages in the homogeneous and heterogeneous groups, a box plot is drawn. In Figure 11 the average number of messages for each type of group can be seen.

There are 4 groups which are identified as outliers (shown as red plus sign in Figure 11). The reason for these outliers is that these groups preferred to do the activity by discussing each question in detail together on the forum whereas the other 31 groups preferred to share the activity questions among the group members, then put the answers together, finalize and submit. So when these 4 groups are discarded from the data set, totally 31 groups are left. The descriptive statistics for the 31 groups are given in Table 20.

Table 20: The descriptive Statistics for the Number of Messages of Homogeneous and Heterogeneous Groups

	Hom.	**Het.**
Number of groups	12	19
Min. number of messages	2.00	1.33
Max. number of messages	8.00	7.50
Median of number of messages	3.67	4.50
Mean of number of messages	4.29	4.24
Std. dev. of number of messages	1.71	1.58

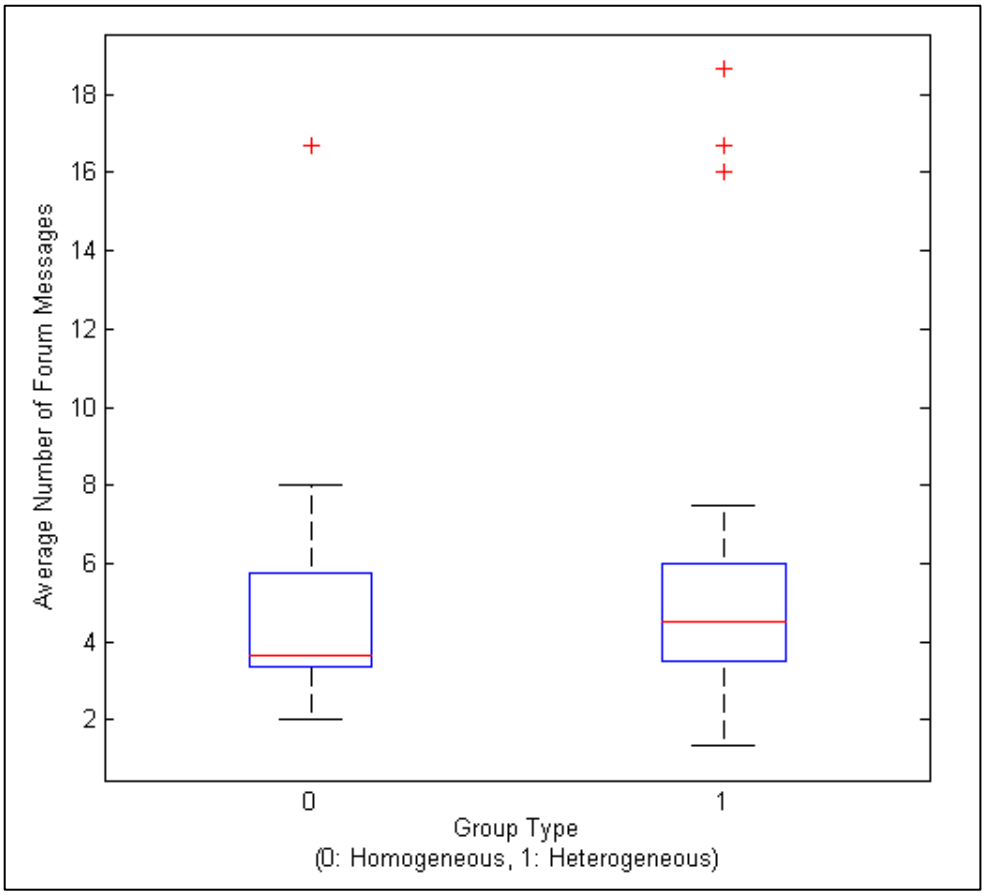

Figure 11: The Average Number of Forum Messages for Homogeneous and Heterogeneous Groups

It can be seen from Table 20 that the mean of homogeneous and heterogeneous groups are almost equal (4.29, 4.24). The standard deviation values are also close for homogeneous (1.71) and heterogeneous groups (1.58).

Nevertheless, in order to show the statistical significance, a statistical test is performed. Before, the normality of the forum messages is calculated with Kolmogorov-Smirnov and Shapiro-Wilk Test. The results are given in Table 21. The test is performed in SPSS v20. The results show the significance of the Kolmogorov-Smirnov test is equal to .20, and it is specified on the output report that .20 is the lower bound of the true significance. The significance of the Shapiro-Wilk Test is higher (p=.47). Depending on these results it can be said that the data is normally distributed. The Skewness and Kurtosis values are also close to zero; this result is also expected when data set is normally distributed. The histogram and Q-Q plot for the average number of forum messages can be seen in Appendix L.

Table 21: The Results of the Normality Test for the Average Number of Forum Messages

	Kolmogorov-Smirnov			Shapiro-Wilk				
	Statistic	df	Sig.	Statistic	df	Sig.	Skewness	Kurtosis
Average Number of Forum Messages	.09	31	.20*	.97	31	.47	.381	.317

*. This is a lower bound of the true significance.

Since data is normally distributed and the group number is equal to 2, t-test can be performed on the data. Before performing t-test, Levene's Test for Equality of Variances should be performed, and then the results of t-test should be interpreted upon the results of Levene's Test. As a result of Levene's Test, the F value is calculated as .22, and the significance value is .64 which means the variances of both groups (homogeneous and heterogeneous) are equal.

The t-test is performed with significance level as .05. The results of the t-test are given in Table 22. It shows that the t value is equal to .09, and the significance is .93 which is much higher than .05. So it can be said that there is no difference between the average number of messages for homogeneous and heterogeneous groups. The hypothesis is not supported.

Table 22: The results of T-test for the Average Number of Forum Messages of Homogeneous and Heterogeneous Groups

	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Average number of forum messages	.09	29	.93	.06	.60	-1.18	1.29

Hypothesis 4: There is a relation between the level of personality trait scores of the students in the group and the number of forum messages sent by students.

We aim to investigate the relation between the level of personality trait scores of the group members and the average number of messages sent to the forum as in Section 4.5.1. The same procedure is followed as explained for Hypothesis 2. Again, the homogeneous groups are used for comparing, the average personality trait scores of all students in these groups are considered. If all members have the same score on a trait, the group is removed. Then, the descriptive statistics are generated as in Table 23.

Table 23: The Descriptive Statistics for Average Number of Forum Messages of Homogeneous Groups on Personality Traits

	Ext.	**Agr.**	**Cons.**	**Emo.**	**Open.**
Number of groups	25	22	25	22	25
Min. grade	1.33	1.33	1.50	1.50	2.00
Max. grade	8.00	8.00	8.00	8.00	8.00
Median of grades	4.00	4.50	4.00	3.84	4.50
Mean of grades	4.17	4.41	4.32	4.10	4.40
Std. dev. of grades	1.71	1.77	1.60	1.52	1.41

Again, the scatter plots of each trait scores and the average number of forum messages are drawn in order to analyze whether there is a relation between them. The plots can be found in Appendix M. In these plots, the x axis shows the average scores of the personality traits, the y axis shows the average number of forum messages. It is hard to see a correlation between the

personality trait scores and the average number of forum messages. In order to find out real results, the Pearson Correlation Coefficient is calculated for each trait scores and the group grades. The results are in Table 24.

Table 24: The correlation between the Personality Trait Scores and the Average Number of Forum Messages

	Number of groups	**Pearson Correlation**	**Sig. (2-tailed)**
Extraversion – Avg. No. of Forum Msg.	25	-.11	.60
Agreeableness - Avg. No. of Forum Msg.	22	-.03	.89
Conscientiousness - Avg. No. of Forum Msg.	25	.02	.94
Emotional Stability - Avg. No. of Forum Msg.	22	.16	.49
Openness - Avg. No. of Forum Msg.	25	-.27	.19

The correlation results show that no significant relation between any personality trait and the average number of forum messages is found. The highest correlation coefficient is found between Openness and the average number of messages. But its significance value is above .05 so it cannot be said that it is a significant relationship.

As a conclusion, in this section it is hypothesized that both group types (homogeneous and heterogeneous) and the level of personality trait scores are effective on the groups' average number of postings in the forum. We tried to find a relation between them. For group type and the number of messages, t-test results show that it cannot be said that there is a difference between homogeneous and heterogeneous groups' postings. For the level of personality trait scores and the number of messages, the correlations are calculated. But again, no relation is found between the level of trait scores and the number of postings.

4.5.3. Hypotheses about Influence in Online Groups

In this subsection the hypotheses about influence are proposed. In the 5th hypothesis, we investigated whether the personality affects being influential in online groups. Hypothesis 6 is divided into three which are related to each other. In these sections the relation between influential-initiator students, influential-submitter students, and initiator-submitter students is

investigated. For Hypothesis 7, by the help of the quantitative methods, the strategist students are determined and the relation with their personality characteristics is investigated.

Hypothesis 5: There is a difference between the personality characteristics of the students who are perceived as influential in groups and who are not.

We investigated whether the personality types of the students affect their influence in groups or not. Accordingly, in the post-study survey, the students were asked to rate their group members according to their participation and influence on the other members. Every student is rated between 1 and 3; 1 shows the most influential students, and 3 shows the least influential students.

Before analyzing the results, the data set obtained from the post-study survey is analyzed. Since there are 2-membered and 3-membered groups, a student may be rated by only 1 student if he/she is in a 2-membered group, or rated by 2 students if he/she is in a 3-membered group. In this personality-influence study, only the students who are rated by 2 students are considered because only 1 rating may provide misleading results. Totally, 53 students are rated by 2 raters.

When the ratings of 2 or more raters are considered, it is important that the raters should agree on their ratings in order the ratings to be reliable (Cohen, 1960). Kappa statistics could be used for that purpose but it must be the same 2 raters to calculate Kappa statistics and to find their overall agreement. But in this study, the raters always change. A student is rated by their group members, and the group members are different for each group. However, there are 6 combinations of ratings as shown in Table 25. The strength of the raters' agreement is classified by the help of the study of Landis and Koch (1977). If a student is rated as 1 by one rater, and is rated as 3 by the other rater, there is a poor agreement. If he/she gets 1 from one, and 2 from other, or 2 from one, 3 from other; it is labeled as moderate agreement. Lastly, if a student gets 1, 2 or 3 from both raters, it is considered as perfect agreement. Table 25 also shows the strength of all 6 combinations.

The combination of 1-3 (the first row shown in Table 25) is removed from the data set to decrease the inconsistencies. There are 3 students who get 1 and 3 from their raters, so only 50 students are left.

Table 25: The Strength Classification for the Raters' Agreement

Rater 1	Rater 2	Agreement
1	3	Poor
1	2	Moderate
2	3	Moderate
1	1	Perfect
2	2	Perfect
3	3	Perfect

The most influential students are determined in the groups by taking the average of their ratings. For example; if a student gets 2 and 3 from their raters, his/her influence rate is equal to 2.5. The most influential students are the ones with the highest influence ranks in their groups. They are classified as 1, and the others (not most influential in the groups) are classified as 0. There is 1 group which has all the members with the same influential ranks. Its members are also removed because it is not possible to determine which student is the most influential. Also there are 4 students who cannot be compared with their group members because either their group members are not ranked by 2 raters (this is because the members who did not fill the post-study survey) or their group members are the ones who are removed from data set since they get 1 and 3 from their rankers (i.e. because of poor agreement). These 4 students are left in their groups with no other student to compare, so they are also removed from data set. After removing them, totally 44 students are left.

We aim to compare if the most influential students have the highest score of personality traits in their groups. So the same strategy is used for the personality trait scores. If the student has the highest score on a trait in his/her group, he/she is classified as 1, otherwise as 0. Again, if the group consists of the students with the same scores, the group is eliminated for that trait. For this reason, the number of students changes from trait to trait. For Extraversion 6 students, for Agreeableness 3 students, for Conscientiousness 11 students, for Emotional Stability 8 students, for Openness 4 students could not be compared so they are removed.

The cross-tabulation between the traits and influence rates is performed. Also the statistical significance of the relation is measured with Pearson Chi-Squared Test. The cross-tabulation table is shown in Appendix N. The results of Chi-Square Test are given in Table 26.

Table 26: The results of Chi-Square Test between the Influence Rate and the Personality Traits

	Number of Students	Pearson Chi-Square Value	df	Asymp. Sig. (2-sided)
Extraversion - Influence Rate	38	1.99	1	.16
Agreeableness - Influence Rate	41	.38	1	.54
Conscientiousness - Influence Rate	33	.29	1	.59
Emotional Stability - Influence Rate	36	3.21	1	.07
Openness - Influence Rate	40	.02	1	.90

The results show that even though none of them is statistically significant (below .05), the significance of Emotional Stability is very close (.07). It can be interpreted there is a weak relation between Emotional Stability scores and Influence Rates of the students. The cross-tabulation also shows that 57.10% of the most emotional stable students are also the most influential in their groups. So the students with high Emotional Stability scores tend to be the influential ones in online study groups.

The second highest Chi-Square value is obtained with Extraversion. Again, the significance value is not below .05 but it is lower than Agreeableness, Conscientiousness, and Openness. When comparing with their values, the Chi-Square value of Extraversion is higher. From the cross-tabulation, it is seen that 53.50% of the most extravert students are also influential students. It can be interpreted that Extraversion is also important on determining the influential students.

Hypothesis 6a: The students who initiated a conversation on the forum are also the most influential students in their groups.

It is hypothesized that the students who initiated a conversation on the forum tend to be perceived as the most influential students in the groups. Initiating a conversation may influence others and at the end of the study those students may be ranked as the most influential students

by the other members. It is investigated whether any relation exists between being the initiator and being the most influential group member.

The influence rates were determined in the same manner as in Hypothesis 5. The students who initiated conversation on the METU-Online forum (from now on it is called the "initiator") are determined by examining the forum messages. In order a student to be an initiator, he/she must have posted the first related forum message about the online study. For example; saying "Hi guys, when will we start studying together on activity?" is counted as a first related message about study, but just saying "Hi" is not counted. The main purpose here is to find the influential students related to studying together and influence others on studying, so only the study-related first messages are counted. If the student posts a related first message, he/she is selected as an initiator in the group.

The cross-tabulation is performed on the initiators and the influencers. Then Pearson-Chi Squared Test is performed. The cross-tabulation can be seen in Appendix O. The results of Chi-Square Test are in Table 27.

It can be obviously seen that the initiator students are also the influential ones in the groups (χ^2 = 12.09, df = 1, p = .00). The students in the groups give high ranks to those who initiated a conversation about study, so they are perceived as the influential students.

Hypothesis 6b: The students who submitted the activity file are also the most influential students in their groups.

At the beginning of the study it is wanted from the students to select a person in their groups in order to submit their answers. In other words, only one student can submit the answers, not all of them. The purpose of this request is to investigate whether there is a relation between being the student who submitted the activity file and therefore selected as the most influential student.

The submitters are determined in the same way with the initiators. If a student submits the file, he/she is selected as the submitter. Then the cross-tabulation and Pearson Chi-Squared Test are performed. The cross-tabulation is in Appendix O, and the results of Chi-Square Test are in Table 27.

The results show that the students who submit the activity are perceived as influential by the other members (χ^2 = 14.49, df = 1, p = .00). From the cross-tabulation it is seen that 76.50% of the submitters are chosen as the most influential members in the groups.

Hypothesis 6c: The students who submitted the activity file are also the students who initiated conversation on forum.

Since there is a high relationship between the influential students and the initiator students, and the influential students and the submitter students, it is wanted to be analyzed whether the initiator and the submitter students are the same students. Hence, a cross-tabulation and Pearson Chi-Square Test are performed between the initiators and the submitters. The cross-tabulation results can be seen in Appendix O, and the results of Chi-Square Test are in Table 27.

From the Chi-Square Test results, it can be said that the initiators are also the submitters in the groups (χ^2 = 6.04, df = 1, p = .01). 62.50% of the initiators submitted the activity file in the groups. Since they are mostly the same students, it is normal to be perceived as influential by other students. It can be said that they are the most active students in the groups so they are chosen as the most influential students by their group friends.

Table 27: The results of Chi-Square Tests for Initiator, Submitter and Influential Students

	Number of Students	**Pearson Chi-Square Value**	**df**	**Asymp. Sig. (2-sided)**
Initiator - Influential	44	12.09	1	.00
Submitter - Influential	44	14.49	1	.00
Initiator - Submitter	44	6.04	1	.01

Hypothesis 7: There is a difference between the personality characteristics of the students who develop strategies in groups and who do not.

When the forum messages on METU-Online were examined, it was noticed that the students who developed the strategies in the groups and the ones who initiated a conversation or submitted the activity file are different from each other. The students who developed the collaboration strategies are mostly the ones who participated the conversation later (not the initiators). Also, they may not be selected as the most influential students because the students

tend to choose the ones who initiated the conversations, or submitted the file as shown in Hypothesis 6a and 6b. So we also wanted to investigate whether there is a relation between the students' personality characteristics and being the student who developed the collaboration strategy such as making work-sharing, planning time to study etc. These students are identified by observing the content of the forum messages. The strategist students are distinguished from the others by examining their wordings, and the attitudes of the others. A sample conversation is given below in a group, and the way that distinguishing the strategist student is explained:

Student B: Hi guys, how will we do the activity?

Student A: If you are all available, we can set up an hour and finish the study together.

Student B: Okay, when will we do?

Student C: I agree, if you tell what time we will do, I will be online on forum.

Student A: Tomorrow 10:00 PM?

Student C: It is convenient for me.

(After some time later)

Student A: I have read the explanations of the study. We can answer the questions together by discussing on the forum, or share the questions among us then put the answers together in one activity file and submit. I think sharing the questions would be more practical. I can answer 1st and 4th questions; you can answer 1 question each from remaining ones. Is this okay for you?

Student C: Okay, I take the 3rd question.

From this conversation it is clearly seen that Student A is the student who specifies the strategy that the group should follow, and makes the planning. In some groups the strategists are also the initiators, but sometimes they are not. So it is also important that determining the characteristics of the students who make plans and guide the others during the study. Wordings that the strategists mostly use, and differs them from the others are given below:

- Setting up time and date: *"We can do the activity on (specific time and date)."*
- Specifying the group's method: *"We can share questions."*
- Sharing questions specifically: *"I will answer question (question number), you can share remaining ones."*

- Finalizing the activity: *"I think the answers are okay, we can submit them in this way. (Student name) can you upload it, please?"*

The strategists are determined according to the frequencies of the above wordings. Only in 1 group the strategist cannot be determined because they only used the forum for posting the questions, they just wrote the answers, but there was not an interactive conversation. 3 students in the group are removed. The remaining 79 students are classified whether he/she is strategist or not. First of all, the students with the highest personality trait scores were determined (as in Hypothesis 5). Again, if all students have the same score on a trait, they are removed.

The cross-tabulation and Pearson Chi-Squared Test are performed between the strategists and the students with the highest scores. The cross-tabulation table is given in Appendix P. The results of Chi-Square Tests are in Table 28.

Table 28: The results of Chi-Square Test between the Strategists and the Personality Traits

	Number of Students	**Pearson Chi-Square Value**	**df**	**Asymp. Sig. (2-sided)**
Extraversion – Strategist	68	9.61	1	.00
Agreeableness - Strategist	74	.20	1	.66
Conscientiousness - Strategist	64	.73	1	.39
Emotional Stability - Strategist	73	1.57	1	.21
Openness - Strategist	63	9.66	1	.00

The results of Chi-Square tests show that Extraversion (χ^2 = 9.61, df = 1, p = .00) and Openness (χ^2 = 9.66, df = 1, p = .00) are significantly affect being strategist or not. When it is looked at the cross-tabulation, it is seen that 65.52% of the most Open students are also selected the strategists in their groups, and 64.52% of the most Extravert students are selected as the strategists in their groups. It is expected because it is known that people with high Openness scores are willing to the new experiences and the new strategies. Because of their natures, they can come up with new ideas to their groups. Also, Extraverts do not hesitate saying what they think, they do not afraid of being judged by others. The other students with lower Extraversion scores may not express themselves and their opinions as strongly as the ones with high

Extraversion scores, so they may choose to agree on the idea which is produced by most Extravert students in the groups.

4.5.4. Hypotheses about Personality and Social Media Use

Lastly, the effects of the personality traits on the social media use are investigated. Accordingly, the following hypothesis is developed:

Hypothesis 8: There is a relation between the personality type and the use of social networking web-sites.

In the pre-study survey, it is also asked to the students which social networking web-sites they use. Totally, 6 web sites (Facebook, Twitter, Instagram, Google+, Linkedin, and Hocam.com) are presented to the students in order to let them choose which one(s) they use. The answers of the pre-study survey were examined, and the outliers were eliminated from the data set. After the outlier analysis, 208 students' answers were decided to use for the further analyses. 4 participants did not respond to the question about the use of social networking sites so the answers of the remaining 204 students are used in analysis.

At first, the total number of social networking sites that each student uses is determined by summing the choices that the student states in the survey. For example; if a student specifies that he/she uses Facebook and Twitter, his/her total number of social networking sites used becomes 2. When all the students' choices are identified, the frequencies of the social sites use are determined. The frequency table is shown in Table 29.

Table 29: The Frequencies of Social Networking Sites Used

	Frequency	Percent	Cumulative Percent
None	7	3.4	3.4
1 site	70	34.3	37.7
2 sites	58	28.4	66.2
3 sites	42	20.6	86.8
4 sites	20	9.8	96.6
5 sites	7	3.4	100.0
Total	204	100.0	

7 students specified that they are not a member of any of the given social networking sites. Also 7 students specified that they are the members of 5 given social networking sites. Since they form the minority of the population (3.4%), 7 students who are not a member of any sites are merged with the students who specified that he/she uses 1 social site. It makes sense because the new class consists of either not members or only members of 1 site; their use of social sites is lowest. 7 students who specified that they are members of 5 social sites are merged with the previous class which consists of members of 4 social sites. Again, this new class presents the students whose use of social sites is highest.

Then, each student is classified according to the trait scores as "Low", "Medium Low", "Medium High", and "High". This scale is developed upon each trait's norms specified in the study of Gosling et al. (2003). These norms can be found in Appendix T. Classifying according to norms is carried out as follows:

Mean(x): Mean of the trait *x* specified in the study of Gosling et al. (2003)
SD(x): Standard deviation of the trait *x* in the study of Gosling et al. (2003)
Score(x): Score of the participant on the trait *x*
Class(x): Class of the participant on the trait *x*

$$Class(x) = \begin{cases} \text{"Low"} & if Score(x) < Mean(x) - SD(x) \\ \text{"Medium Low"} & if Mean(x) - SD(x) \leq Score(x) < Mean(x) \\ \text{"Medium High"} & if\ Mean(x) \leq Score(x) < Mean(x) + SD(x) \\ \text{"High"} & otherwise \end{cases}$$

The classes are numbered as 1, 2, 3, and 4 for "Low", "Medium Low", "Medium High", and "High" respectively. Then the frequencies for all the traits are determined. The frequency tables for the traits are provided in Appendix R. For Extraversion, 7 students who are members of "Low" class are merged with "Medium High" class. The others are remained the same.

In order to find whether there is any relation between the social media use and the personality class of the students, the cross-tabulation and Pearson Chi-Squared Test are used. The cross-

tabulation tables are given in Appendix S. The results of Chi-Square Tests are shown in Table 30.

Table 30: The results of Chi-Square Test between Social Media Use and the Personality Traits

	Number of Students	Pearson Chi-Square Value	df	Asymp. Sig. (2-sided)
Extraversion – Social Media Use	204	7.89	6	.25
Agreeableness - Social Media Use	204	2.74	9	.97
Conscientiousness - Social Media Use	204	12.17[a]	9	.20
Emotional Stability - Social Media Use	204	8.05[b]	9	.53
Openness - Social Media Use	204	17.26[c]	9	.05

a. 2 cells (12.5%) have expected count less than 5. The minimum expected count is 2.51.
b. 1 cell (6.2%) has expected count less than 5. The minimum expected count is 3.31.
c. 1 cell (6.2%) has expected count less than 5. The minimum expected count is 4.37.

It is seen that most effective personality trait on social media use is Openness (χ^2 = 17.26, df = 9, p = .05). It is also statistically significant since p value is equal to .05. From the cross-tabulation, it can be seen that the student with high Openness scores tend to be the members of more social networking sites. It is expected since people who have high Openness scores are open to new experiences, so it is reasonable that the higher of Openness score, the more of social networking memberships.

The second effective personality trait appears to be Conscientiousness but it is not statistically significant on the social media use (χ^2 = 12.17, df = 9, p = .20). The most irrelevant is Agreeableness with the significance value of .97. It is almost impossible to say that there is a relation between Agreeableness level of students and their social media use.

Because the cross-tabulation between the personality traits and social media use has the cells which have expected count less than 5, the relation between the direct personality trait scores and the number of social media sites used without classifying the personality traits is investigated. The correlation between the personality trait scores of the students and the number of social media sites they use is calculated. Pearson Correlation Coefficient is used for the analysis, and the results are given in Table 31.

Extraversion and Openness to Experience are found as related to social media use after correlation analysis. The results are meaningful and consistent with the previous studies. Ross et al. (2009) found Extraversion and Openness are related to Facebook use. Also, Correa et al. (2010) found that the same traits are positively related to social media use whereas Emotional Stability is a negative predictor.

Table 31: The correlation between the Personality Trait Scores and the number of Social Media web-sites

	Number of students	Pearson Correlation	Sig. (2-tailed)
Extraversion – No. of Social Media Sites	204	.15*	.03
Agreeableness – No. of Social Media Sites	204	.05	.48
Conscientiousness – No. of Social Media Sites	204	.05	.45
Emotional Stability – No. of Social Media Sites	204	.01	.84
Openness – No. of Social Media Sites	204	.15*	.03

*.Correlation is significant at the .05 level (2-tailed)

Hypothesis 9: There is a relation between the personality type and the frequency of Facebook use.

We aimed to investigate whether personality type affects the frequency of social media use. Facebook is selected for this analysis because it has the largest number of members among the students according to the results of the pre-study survey. 90.69% of 204 students (N = 185) indicated that they are a member of Facebook. Among these 185 students, 1 student did not answer to the question about the frequency of Facebook actively use. So the total number of data points is 184.

In pre-study survey the frequency of actively use per day was separated into 4 different scales. Each scale and its frequencies are shown in Table 32.

Table 32: The scales for the frequency of Facebook use

Frequency of Facebook use per day	Number of Students	Percent	Cumulative Percent
Not every day	66	35.9	35.9
Once	23	12.5	48.4
Twice	27	14.7	63.0
Three times or more	68	37.0	100.0
Total	184	100.0	

The correlation between the personality trait scores of the students and the frequency of Facebook use is calculated. Pearson Correlation Coefficient is used for the analysis, and the results are given in Table 33.

Table 33: The correlation between the personality trait scores and the frequency of Facebook use

	Number of students	Pearson Correlation	Sig. (2-tailed)
Extraversion – Frequency of Facebook use	184	.36**	.00
Agreeableness – Frequency of Facebook use	184	.20**	.01
Conscientiousness – Frequency of Facebook use	184	.17*	.02
Emotional Stability – Frequency of Facebook use	184	.11	.14
Openness – Frequency of Facebook use	184	.22**	.00

**.Correlation is significant at the .01 level (2-tailed)

*.Correlation is significant at the .05 level (2-tailed)

As it can be seen from Table 33, all personality traits except Emotional Stability are effective on the frequency of Facebook use. The most effective one is Extraversion. The correlation coefficient between Extraversion trait scores and the frequency of Facebook use is .36 and it is significant at the .01 level. It means that while the level of Extraversion increases, the frequency of Facebook use increases, too. The second effective trait is Openness. The more open students tend to use Facebook more actively. Agreeableness is also found related to Facebook use. Based on the results, the more Agreeable students use Facebook more actively in a day. It is interesting that the more Conscientious students are found as using Facebook more active than less Conscientious ones. But the effect of Conscientiousness is lower than others'. The results are

expected according to the previous studies such as Ross et al. (2009), Correa et al. (2010). It is obviously seen that personality factors affect Facebook use, so they are related.

4.6. Summary of Findings

In this study, the effects of personality traits are investigated on group success, group online communication, influence in online study groups, and social media use. Accordingly, 9 hypotheses were developed, and tested with several statistical tests. The results for each hypothesis are given in Table 34. The findings are discussed in Chapter 5.

Table 34: The Summary of the Hypothesis Tests

Hypothesis	Supported?	Result
Hypothesis 1	Partially	Even though group diversity has effects on group success, other factors such as the faculty they have been studying, the gender dominate these effects.
Hypothesis 2	Yes	Emotional Stability is found as a negatively effective trait on group success, the other traits are found irrelevant.
Hypothesis 3	No	There is no effect of group diversity on online communication of groups.
Hypothesis 4	No	None of the personality traits is found related to online communication of groups.
Hypothesis 5	No	Even though the relation between Emotional Stability and influence is found, this relation is not statistically significant ($p > .05$).
Hypothesis 6a	Yes	The students who initiated the conversation in groups are perceived as the most influential students by other members.
Hypothesis 6b	Yes	The students who submitted the activity in groups are perceived as the most influential students by other members.
Hypothesis 6c	Yes	The students who initiated the conversation in groups are also the students who submitted the activity.
Hypothesis 7	Yes	The students who developed strategies in online groups have high scores on Extraversion, and on Openness.
Hypothesis 8	Yes	Extraversion and Openness are found as positively related to the number of social media web-sites used.
Hypothesis 9	Yes	Extraversion, Agreeableness, Conscientiousness and Openness are found positively related to the frequency of Facebook use.

CHAPTER 5

DISCUSSION AND CONCLUSION

In this final chapter, the results found at the end of the study are discussed. The conclusion, the contribution of the study, limitations and further research are presented with the limitations and further research.

5.1. Discussion and Conclusion

When reviewing the literature, it is seen that several studies investigated the relation between group success and member personalities. Also there are studies which found significant relationship between group influence and personality characteristics of the members. Each study has its own contributions and each of them motivate us throughout our study.

We aimed to analyze the effects of personality traits on the success of small online groups. Before starting the study, we simulated the three-phases of our design on a small number of students (N=9). The problems in the first survey were corrected after the pilot study, and then the study was announced to all IS100 students. In total 474 students participated to the first survey however most of them filled in the survey in an inconsistent way. The outliers were eliminated from data set. The study of Gosling et al. (2003) was the reference point for the reliability of the personality test. We expected to find similar test-retest reliability, and after outlier analysis the test-retest reliability for each trait was very close to their values (Gosling et al., 2003).

When the descriptive statistics of the personality traits is examined (Table 3), the mean of Extraversion trait is found higher than the general norm found in Gosling et al. (2003) (see Appendix T). On the item-basis most of the students claim that they are extraverted, and

enthusiastic (mean=5.18) whereas the reverse item has the mean equal to 2.73. Also, when categorizing the students according to their trait levels (see Section 4.5.4), the number of the students who are low on Extraversion is only 7 among 204 students. The cultural differences may cause this result. Also, we suppose that it is normal that mostly High Extraverts participate to the online study because of their characteristics (such as enthusiasm, sociability). This leads us to perform another analysis which shows the differences between the personality trait scores of the participants and non-participants. As expected, Extraversion and Conscientiousness scores of participants are found significantly higher than the non-participants. Interestingly, Openness scores of participants are found statistically lower than the non-participants. But we assume that it is caused by other factors such as the nature of the study (bonus-rewarded).

Although the students were encouraged to participate to the study using reminders via e-mail, announcements etc., the number of students who dropped out the study was very high. At the end of the semester, 33 of 82 participants (40.24%) passed the course with the help of the bonus reward which is given in the scope of this study; and 32 of 126 non-participants (25.40%) would not be able to pass the course even if they got bonus points. These factors may be affected on students when dropping the study. At the beginning of the study, at least 20 groups for each type (homogeneous and heterogeneous) were targeted but unfortunately totally 35 groups (13 homogeneous, 22 heterogeneous) completed the study. In fact the number of groups was slightly higher than 35 but since students' responses were analyzed at outlier analysis phase, inconsistent results were eliminated in order to improve data quality.

The purpose of the study was investigating the effects of personality traits on the success of the groups so the biases caused by the previous success of the students were not acceptable. The relation between previous assignment scores and group grades was investigated with Pearson Correlation. The results were pleasing; there was not a significant relationship between assignment scores and group grades. It was important because if successful students were found successful again at the end of the study or vice versa, it would mean that the groups formed according to personality have no effect on the success.

Several hypotheses were developed about personality effects on group success, group communication on online platform, group influence, and social media use. In the first and second hypotheses, we tried to find a pattern about the relationship between personality traits

and group success. The diversity calculated by the help of the study of Pieterse et al. (2006) was used throughout the study. Also we showed that this diversity measure is appropriate for our data, it gives an idea about the total variances in groups. We performed statistical tests in order to analyze the effects of group type on group success but the results of the tests showed that there is not a difference between the grades of homogeneous groups and heterogeneous groups.

A regression tree was developed on the attributes faculty, gender, active study days, and diversity of groups. The tree showed that the most effective attribute (which was on the first split on the tree) is faculty. In lower splits of the tree, the gender and active study day factors were seen. Diversity was on the lowest level of the tree which means that the least effective factor on group grades is diversity. It can be discussed in several ways. First of all the faculty of the students (which is separated as natural sciences and social sciences) may make a difference on their learning styles which may be more effective than the personality. But in this study, the effects of the learning styles were not investigated. We focused on personality characteristics. Also when the regression tree was developed, it gave a chance to analyze the relationships among all attributes. For example; personality characteristics are affected by gender, culture etc. (as shown in the study of Gosling et al., 2003). Throughout the study, personality was considered as an independent variable but there may be other factors which in fact affect the personality and make the personality as a dependent variable. Because of that, the factors such as faculty and gender may have become more effective than personality. But these effects were not in the scope of the study hence they are missing. According to the results obtained from the analyses it was concluded that even though personality differences are effective on group success, other factors dominate this effect.

In order to analyze whether an increase in the scores of traits affects the group success, correlation between average trait scores of the homogeneous groups and group grade was calculated. The results showed a significant negative correlation between Emotional Stability and group grade. It is consistent with the previous studies such as the study of Peeters et al. (2006) and Rhee et al. (2013). The gender differences were also investigated for this result. We compared the Emotional Stability scores of female and male students participated to the study. The results showed that there is not a significant difference between them. So for this analysis,

the gender is not effective, i.e. Emotional Stability scores are effective on group success without being affected by gender.

In the analysis of the relation between personality traits and online communication, the effects of personality were not found significant. The forum messages of homogeneous and heterogeneous groups were approximately the same (homogeneous groups' average = 4.29, heterogeneous groups' average = 4.24). Also, the increase in the personality trait scores was not found effective on the number of forum messages posted. In the study of Chen and Caropreso (2004) it was found that the personality does not affect message length on online discussions whereas it affects communication types and pattern. In fact, during the study there were 2 types of communication type among groups: (1) discussing all activity questions on forum, (2) sharing questions among members, and finalize the activity. The groups which preferred the first type were mostly heterogeneous groups (3 heterogeneous groups, 1 homogeneous group) but of course these data numbers are so few to make an interpretation over them.

The second important aim of the study was to identify the influential students in the groups. The influence rates of each student were determined by their group members. In the post-study survey, each student who participated to the study rated his/her group members according to their influence, participation to study. So it can be called as "perceived influence". The results showed no significant relationship exists between personality traits and influence rate. The Emotional Stability was found the most effective but its significance level was not below .05 ($p = .07$). There are several studies which present significant relation between the personality and group influence. Especially, Extraversion is found to be important on predicting leaders and influential individuals (Deuling et al., 2011; Harms et al., 2007; Judge et al., 2002). The main reason for not being observed a relation between personality and influence is caused by the ratings of the students. When the answers of the post-study survey are examined, many students either rated their peers equally or gave high ratings to the peers just because they initiated the conversations or submitted the activity file. This was also shown with the statistical tests in Chapter 4. But we were more interested in the influential students who generate strategies, lead others when they collaborate than in the ones who just initiate or submit. The only way to determine the influential students was examining the forum messages content. It can be considered as a qualitative analysis. Indeed when the students were identified in this way as

"strategists", the results were consistent with the previous studies. We found that Extraversion and Openness are strong predictors for being strategist. This is not contradictory with other studies mentioned above.

Lastly, the relation between personality traits and social media use was investigated. In the pre-study survey, it was asked to the students which social networking sites they use. Depending on the answers of 204 students, Extraversion and Openness traits are found related to the number of social media web-sites. This result is also consistent with the previous studies (Amichai-Hamburger & Vinitzky, 2010; Correa et al., 2010; Ozguven & Mucan, 2013; Ross et al., 2009; Ryan & Xenos, 2011), and it was expected since people who are high on Openness to Experience have a variety of interests and they are willing to follow these interests, and people who are high on Extraversion are sociable and they tend to continue and improve their relations with people on social media sites. Also we conducted an analysis about the relation between personality and the frequency of social media use. We selected Facebook use because it is the most common social networking web-site among the students (90.69%). The correlations between each trait and the frequency of Facebook use were calculated and it has been found that related personality traits are Extraversion, Openness, Agreeableness and Conscientiousness respectively. Again, many studies mentioned above found similar results as in this study.

In summary we tried to analyze the effects of personality on several domains (online group success, online group communication, influence in groups, and social media use) in this study. Even though learning styles are also effective on individual and group success, we focused on the personality effects. We could not find an exact effect of group diversity (or type) on group success but we found other effective factors such as faculty and gender. Also it can be assumed that personality had already an effect of those other factors or vice versa (e.g. gender effects on personality, or personality effects on the faculties of the students they preferred to study). So a more comprehensive study can be conducted with considering these relationships. Also, we found a relation between Emotional Stability level and group success. As an impact of this study, in the future Emotional Stability levels of the students can be considered when forming online groups. In addition to that we found that more Extravert and more Open students tend to develop strategies in online groups, or lead others. When forming online groups these factors can also be taken into account.

5.2. Limitations and Further Research

The study has several limitations. First of all, small number of groups that successfully completed all surveys and the activity restricted the analyses. At first, the main aim was to form minimum 20 groups for each type, but because of outliers and drop-outs we could not reach that number. Also the unbalance between the numbers of homogeneous (13 groups) and heterogeneous (22 groups) was another restriction. The reason for that unbalance is mainly the students who dropped out the study. For example; when the activity is announced among groups, there were several students who could not get an answer from their group members. In order for these students to study in a group they were added to other groups which had also a member who did not respond. Switching students among groups naturally caused to ruin the structure of the groups. Especially homogeneous groups became heterogeneous ones because the personality of newly added students was not the same with others. At the beginning of the study we tried to switch the students' in a way that the homogeneous groups would remain the same. But the students who informed us on the last day of the study were not added to the groups because the others had already started studying together. The time constraints also affected the number of groups.

Even though the other factors were tried not to affect group success, it is seen that the variety of faculties of the students, or how many days they study on the activity affected the group success. When forming groups the differences of METU-Online access among group members were tried to be minimized. But other factors could not be controlled such as faculties, genders of the students. These appear to affect the group success. We also aimed to measure these effects on group success by applying different analysis techniques. We tried to perform regression analysis but again the small number of data points restricted this analysis.

For the further research, more experiments can be performed with larger number of groups by considering the limitations of this study discussed above. Hence, more reliable results can be obtained about the effects of personality traits on group success. Other analysis techniques such as regression could be used with the larger number of data.

In order to minimize the effects of other factors found in this study, group formation can be done with considering these effects. For example; the students can be formed in a way that the

students of the same faculty will be in the same group. Then homogeneous and heterogeneous groups can be formed based on the personality characteristics. In other words, other factors should be controlled and then the groups should be formed as homogeneous and heterogeneous.

Apart from measuring group success, the effects of collaborative online study on individual success can also be measured in the future. The difference between the success of the students who participated to the online study and who did not can be measured with statistical tests, so that the efficacy of online study can also be discussed.

Another further research can be analyzing the effects of social media use on group communication. The students who are more familiar with social media can use online forum more effectively when collaborating than the ones who do not use social media sites. This criterion can be considered when forming study groups and the effects can be observed. Also the analysis which is conducted with Facebook use in this study can be extended with the frequency of other web sites' usage (such as Twitter, Instagram). The results can be compared with each other so that the personality profiles of the user can be constructed for social networking web sites.

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APPENDICES

Appendix A: Pre-Study Survey Questions (in Turkish)

A. DEMOGRAFİK BİLGİLER

Lütfen aşağıdaki bilgileri doldurunuz.

1. Öğrenci numaranız: …….
2. Adınız ve Soyadınız: …….
3. Cinsiyetiniz: □ Erkek □ Kadın
4. Yaşınız: …….
5. Sınıfınız: □ Hazırlık □ 1 □ 2 □ 3 □ 4 □ 5+

B. SOSYAL AĞ BİLGİLERİ

Bu bölümde sosyal paylaşım siteleri kullanımınız hakkında sorular bulunmaktadır. Lütfen soruları cevaplayınız.

1. Aşağıdaki sosyal paylaşım sitelerinden hangilerini kullanıyorsunuz? (Birden fazla seçim yapabilirsiniz.)

□ Facebook □ Twitter □ Google+ □ Linkedin □ Hocam.com □ MySpace □ Instagram
□ Diğer ……

2. Sosyal paylaşım sitelerindeki hesaplarınızı günde kaç kez kontrol ediyorsunuz?

	Her gün etmiyorum	Bir kez	İki kez	Üç kez ya da daha fazla
Facebook				
Twitter				
Google+				
Linkedin				
Hocam.com				
MySpace				
Instagram				
*				
*				

* Kullandığınız diğer sosyal paylaşım sitelerini yazınız.

3. Sosyal paylaşım sitelerindeki hesaplarınızı aktif olarak (paylaşmak, beğenmek, yorum yapmak vb.) günde kaç kez kullanıyorsunuz?

	Her gün kullanmıyorum	Bir kez	İki kez	Üç kez ya da daha fazla
Facebook				
Twitter				
Google+				
Linkedin				
Hocam.com				
MySpace				
Instagram				
*				
*				

* Kullandığınız diğer sosyal paylaşım sitelerini yazınız.

4. Sosyal paylaşım sitelerinde yaklaşık olarak kaç arkadaşınız ya da takipçiniz var?

	0-10	10-50	50-100	100-150	150-200	200 ya da daha fazla
Facebook						
Twitter						
Google+						
Linkedin						
Hocam.com						
MySpace						
Instagram						
*						
*						

* Kullandığınız diğer sosyal paylaşım sitelerini yazınız.

5. Sosyal paylaşım sitelerinde yaklaşık olarak kaç gruba üyesiniz?

	Hiçbir gruba üye değilim	5 ya da daha az	5-10	10-15	15 ya da daha fazla
Facebook					
Twitter					
Google+					
Linkedin					
Hocam.com					
MySpace					
Instagram					
*					
*					

6. Sosyal paylaşım sitelerinde (Facebook ya da diğerleri) hangi bilgilerinizi paylaşıyorsunuz?

□ İsim
□ Cinsiyet
□ E-mail
□ Profil fotoğrafı
□ Telefon numarası
□ Doğum günü
□ Memleket
□ Dini inanç
□ İlişki durumu
□ İlgi alanları
□ Siyasi görüş
□ Kendiniz hakkında
□ Web sitesi
□ Adres
□ Okul bilgisi
□ Ülke
□ Sevdiğiniz müzik
□ Sevdiğiniz kitaplar
□ Sevdiğiniz filmler
□ Sevdiğiniz televizyon programları

7. IS100 sınıfınızdaki öğrencilerden hangileri ile sosyal paylaşım sitelerinde de arkadaşsınız? Lütfen isimlerini yazınız.

8. Lütfen grup olarak çalışmak istediğiniz 3 arkadaşınızın ismini yazınız.

9. Hangi şekilde daha iyi çalışırsınız?

□ Bireysel olarak
□ Grup içerisinde

C. KİŞİLİK ÖZELLİKLERİ

Aşağıda sizi tanımlayan ya da tanımlamayan birçok kişilik özelliği bulunmaktadır. İfadelerin sizi tanımlama düzeyini dikkate alarak, her bir ifadeye katılıp katılmadığınızı belirtmek için 1 ile 7 arasında oylayınız.

1 = Tamamen katılmıyorum

2 = Kısmen katılmıyorum

3 = Biraz katılmıyorum

4 = Kararsızım

5 = Biraz Katılıyorum

6 = Kısmen katılıyorum

7 = Tamamen katılıyorum

"Kendimi …… olarak görürüm."

	1	2	3	4	5	6	7
Dışa dönük, istekli							
Eleştirel, tartışmayı seven[1]							
Güvenilir, öz-disiplinli[2]							
Kaygılı, kolaylıkla hayal kırıklığına uğrayan[3]							
Yeni deneyimlere açık, karmaşık							
Çekingen, sessiz							
Sempatik, sıcak[4]							
Düzensiz, dikkatsiz[5]							
Sakin, duygusal olarak dengeli[6]							
Geleneksel, yaratıcı olmayan							

After the pilot study;

1: Eleştirel, tartışmayı seven (Kavgacı, sürekli kişileri eleştiren)

2: Güvenilir, öz-disiplinli (Sorumluluk sahibi)

3: Kaygılı (Endişeli), kolaylıkla hayal kırıklığına uğrayan

4: Sempatik, sıcak (İnsanlara yardımcı olmayı seven)

5: Düzensiz, dikkatsiz (Kolaylıkla dikkati dağılan)

6: Sakin, duygusal olarak dengeli (Sorunlar karşısında soğukkanlı, stresle başa çıkabilen)

Appendix B: Post-Study Survey Questions (in Turkish)

Bu bölümde katıldığınız çalışmadaki grup arkadaşlarınız ve çalışma ortamınız ile ilgili sorular bulunmaktadır. Lütfen soruları cevaplayınız.

1. Lütfen grup arkadaşlarınızı çalışmanızdaki katılımlarına ve etkilerine göre sıralayınız. 1 en çok katılan / en etkili kişiyi, 3 ise en az katılan / en az etkili kişiyi belirtmektedir.

	Grup üyesi
1	
2	
3	

2. Grup arkadaşlarınızla çalışmaktan ne derece memnundunuz? Lütfen her bir grup arkadaşınız için birini (Çok memnundum, Kararsızım, Memnun değildim) seçiniz.

Grup üyesi	Çok memnundum	Kararsızım	Memnun değildim

3. Grup arkadaşlarınızı çalışmaya katılmadan önce ne derece tanıyordunuz?

Grup üyesi	Tanımıyordum	Tanıyordum	Yakın arkadaşım

4. Aşağıda çalışma grubunuz ve çalışma ortamınız hakkında ifadeler bulunmaktadır. İfadelere katılma durumunuzu 1-5 arasında değerlendiriniz. 1 kesinlikle katılmama, 5 kesinlikle katılmayı ifade etmektedir.

1: Kesinlikle katılmıyorum

2: Katılmıyorum

3: Ne katılıyor ne katılmıyorum

4: Katılıyorum

5: Kesinlikle katılıyorum

	1	2	3	4	5
Çalışma grubum iyi bir performans gösterdi.					
Aktivite üzerinde çalışırken Metu-Online platformunu kullanmak hoşuma gitti.					
Metu-Online grup arkadaşlarımla iletişim kurmak için yeterli özelliklere sahip.					
Metu-Online üzerinden grup arkadaşlarıma kolayca erişebildim.					
Grup arkadaşlarımla iletişim kurmak için başka bir platforma gerek duymadım.					
Grup içerisinde çalışırken memnun ya da rahat değildim.					

5. Grup arkadaşlarınızla iletişim kurmak için Metu-Online dışında kullandığınız platform/araç var mı? Varsa bunları ne sıklıkta kullandınız? (Birden fazla seçebilirsiniz.)

	Hiç kullanmadım	Bir kez	İki kez	Üç kez ya da daha fazla
□ E-mail				
□ Başka bir yazışma (chat) programı				
□ Yüz-yüze görüşme				
□ Telefon				
□ …….				
□ …….				
□ …….				

6. Çalışmaya katılmaktan memnun kaldınız mı? Eğer kalmadıysanız, lütfen sebeplerini yazınız.

□ Evet ☺ □ Kararsızım □ Hayır ☹

Memnun kalmadım çünkü ……..

Appendix C: Activity Questions

1. Your computer screen is black. The led button at the bottom of the screen is off.
   What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.
2. Your colleague, who received your Word document, would like to modify it. However, the document you sent is read only. Give two solutions to handle this situation.
3. You have accidentally downloaded an application to your computer and after downloading it, the computer slows down abnormally, and unexpected error messages (like "Application error", "System fault", "Missing files"…) appear while running Windows applications, the computer does not respond to your commands.
   What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.
4. Viruses do not spread without human action. What may be the source of a virus? What is the solution if a virus infects your computer?
5. After turning the computer on, the following message appears: "Non-System disk or disk error. Replace and strike any key when ready"
   What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.
6. The Ethernet cable is plugged. Local Area Connection seems to be connected; however the web pages could not be opened with browsers.
   What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem (there could be multiple solutions to this problem).
7. What is malicious software (malware)? Which types of malwares have you learned in IS100 class?
8. Your computer's file input and output performance has degraded significantly recently.
   What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.

9. During a software installation, the following message is received: “Not enough memory/insufficient memory”.

   What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.

10. The following error message is received: “Bad sectors found on drive C”.

    What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.

11. The following error message is received: “Windows cannot start this hardware device because its configuration information (in the registry) is incomplete or damaged.”

    What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.

12. Installation failure occurs with the message “not enough disk space to run application” or “no disk space”.

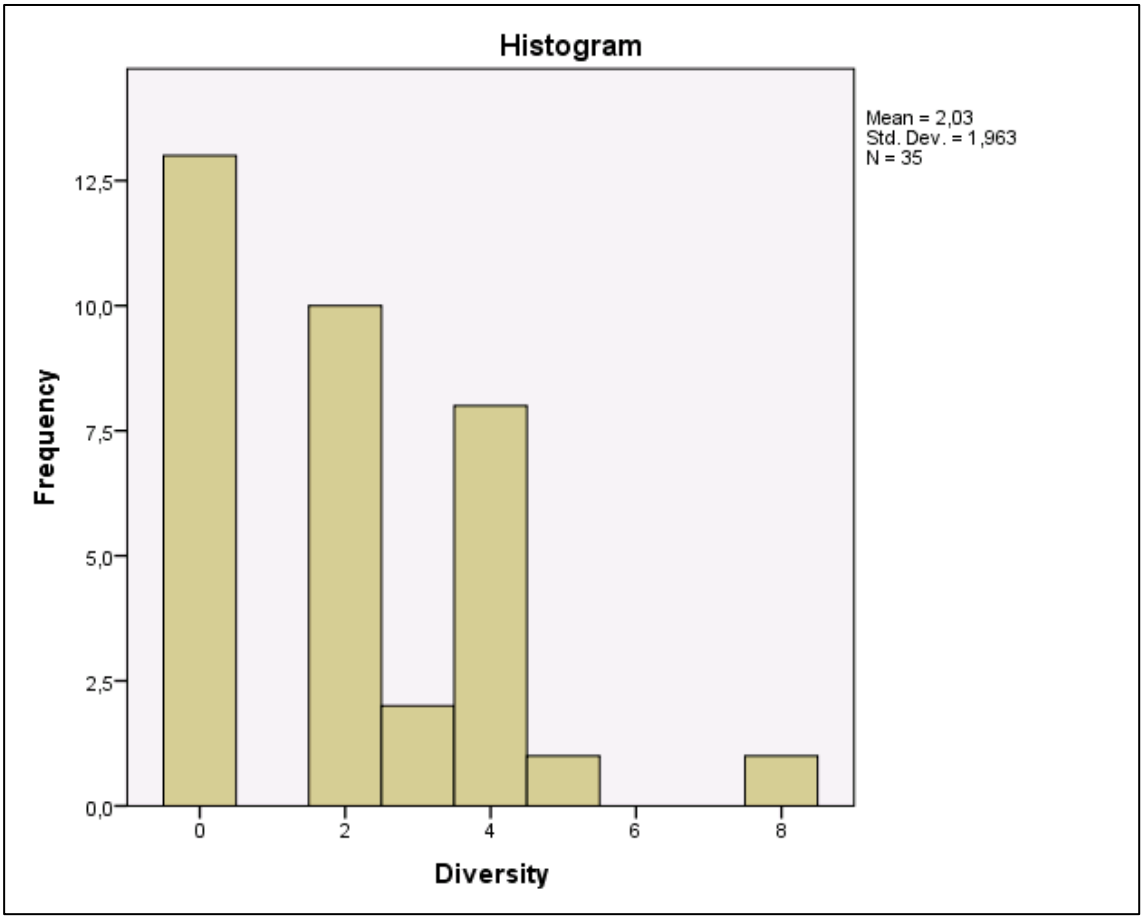
    What type of problem is it? (Hardware, software or both, virus etc.) Find a solution to the problem.

13. What are the categories of computer maintenance? Please explain them in a few sentences.

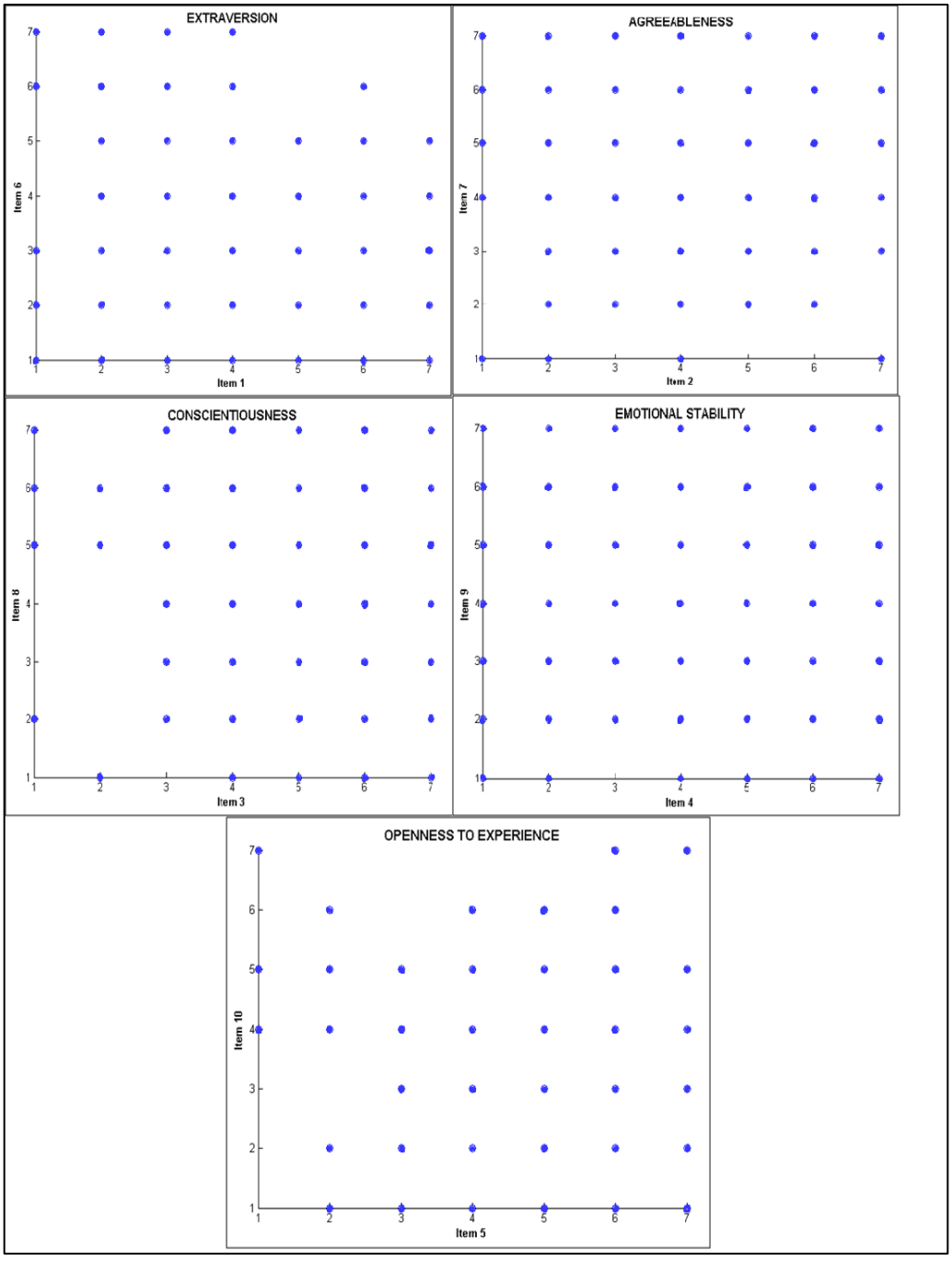
Appendix D: Final Version of Online Groups Formed

Group#	Group Members	Males	Females	Social Science	Natural Science	Study Day	Ext.	Agr.	Con.	Emo. Sta.	Open.	Diversity
1	3	1	2	1	2	1	Hom	Hom	Hom	Hom	Hom	0
2	3	0	3	2	1	0	Hom	Hom	Hom	Hom	Hom	0
3	3	1	2	1	2	1	Hom	Hom	Hom	Hom	Hom	0
4	2	2	0	0	2	1	Hom	Het	Hom	Hom	Hom	2
5	2	1	1	1	1	0	Hom	Hom	Hom	Hom	Hom	0
6	3	0	3	1	2	1	Hom	Hom	Hom	Hom	Hom	0
7	2	1	1	0	2	0	Hom	Hom	Het	Hom	Hom	2
8	2	1	1	1	1	1	Het	Hom	Hom	Hom	Hom	2
9	2	1	1	1	1	1	Hom	Hom	Hom	Hom	Hom	0
10	2	0	2	1	1	1	Hom	Hom	Hom	Hom	Hom	0
11	2	1	1	1	1	2	Hom	Hom	Hom	Hom	Hom	0
12	3	0	3	1	2	2	Hom	Hom	Hom	Hom	Hom	0
13	2	0	2	2	0	0	Het	Het	Het	Het	Hom	8
14	3	0	3	1	2	1	Het	Hom	Het	Het	Het	5
15	2	1	1	1	1	1	Het	Het	Hom	Hom	Hom	4
16	3	2	1	0	3	0	Het	Het	Hom	Het	Het	4
17	3	1	2	1	2	0	Hom	Hom	Het	Het	Het	3
18	2	1	1	0	2	1	Hom	Hom	Hom	Het	Het	4
19	2	1	1	0	2	1	Hom	Hom	Hom	Het	Hom	2
20	2	0	2	0	2	1	Hom	Hom	Het	Het	Hom	4
21	2	1	1	0	2	0	Hom	Hom	Hom	Hom	Hom	0
22	3	1	2	1	2	1	Het	Het	Het	Hom	Het	4
23	2	1	1	1	1	0	Hom	Het	Hom	Hom	Hom	2
24	3	3	0	2	1	2	Het	Hom	Hom	Het	Het	4
25	2	1	1	2	1	2	Hom	Het	Hom	Hom	Hom	2
26	2	1	1	0	2	1	Hom	Het	Hom	Hom	Hom	2
27	2	2	0	0	2	1	Hom	Hom	Hom	Hom	Hom	0
28	2	1	1	2	0	1	Hom	Hom	Hom	Hom	Hom	0
29	2	1	1	1	1	2	Hom	Het	Hom	Hom	Het	4
30	3	1	2	1	2	0	Het	Hom	Het	Hom	Het	3
31	2	1	1	2	0	0	Hom	Hom	Hom	Hom	Hom	0
32	2	1	1	0	2	2	Hom	Hom	Hom	Het	Hom	2
33	3	0	3	2	1	1	Het	Het	Hom	Het	Het	4
34	2	0	2	1	1	0	Hom	Hom	Hom	Het	Hom	2
35	2	1	1	0	2	3	Hom	Hom	Het	Hom	Hom	2

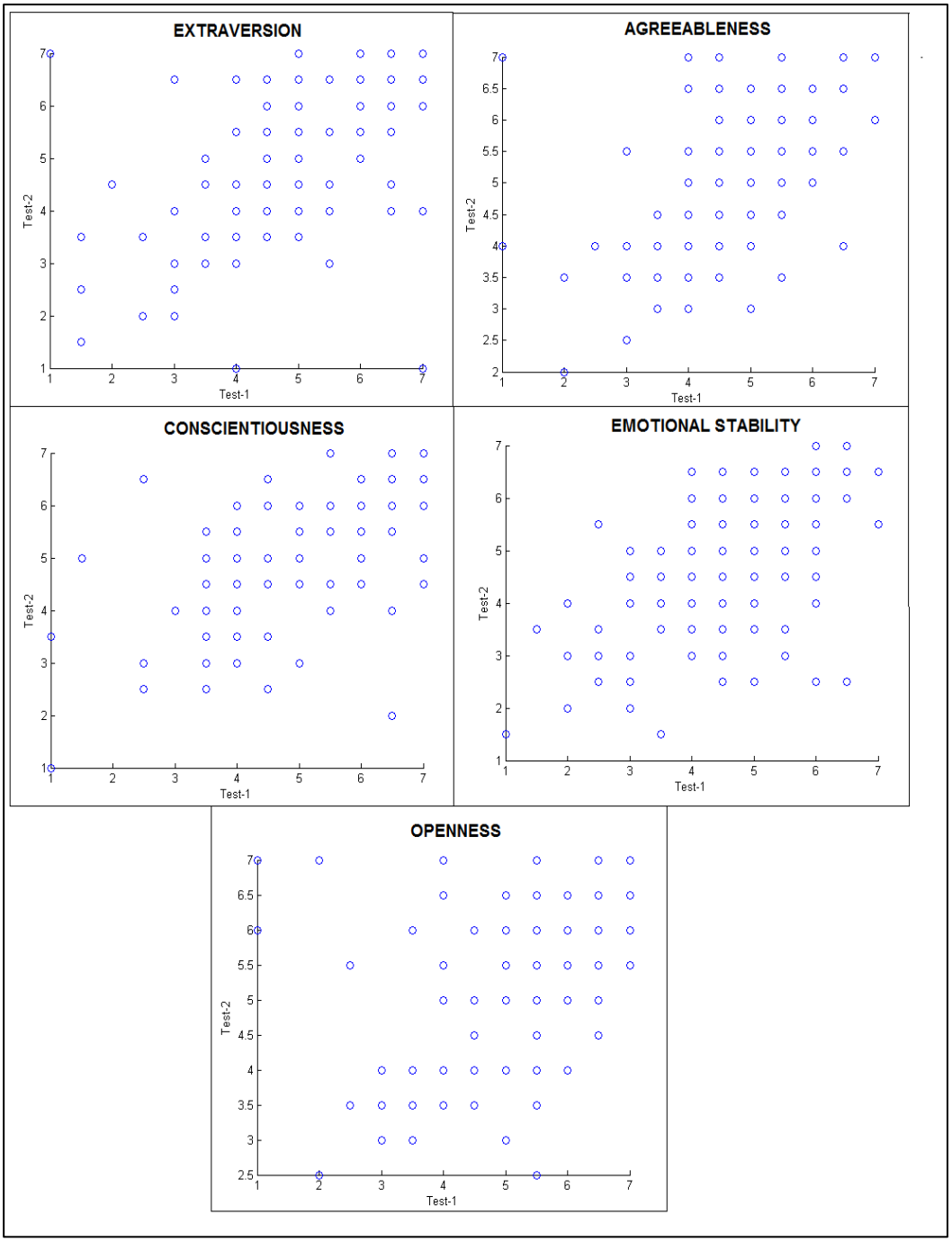
Appendix E: Histogram of Diversity Values



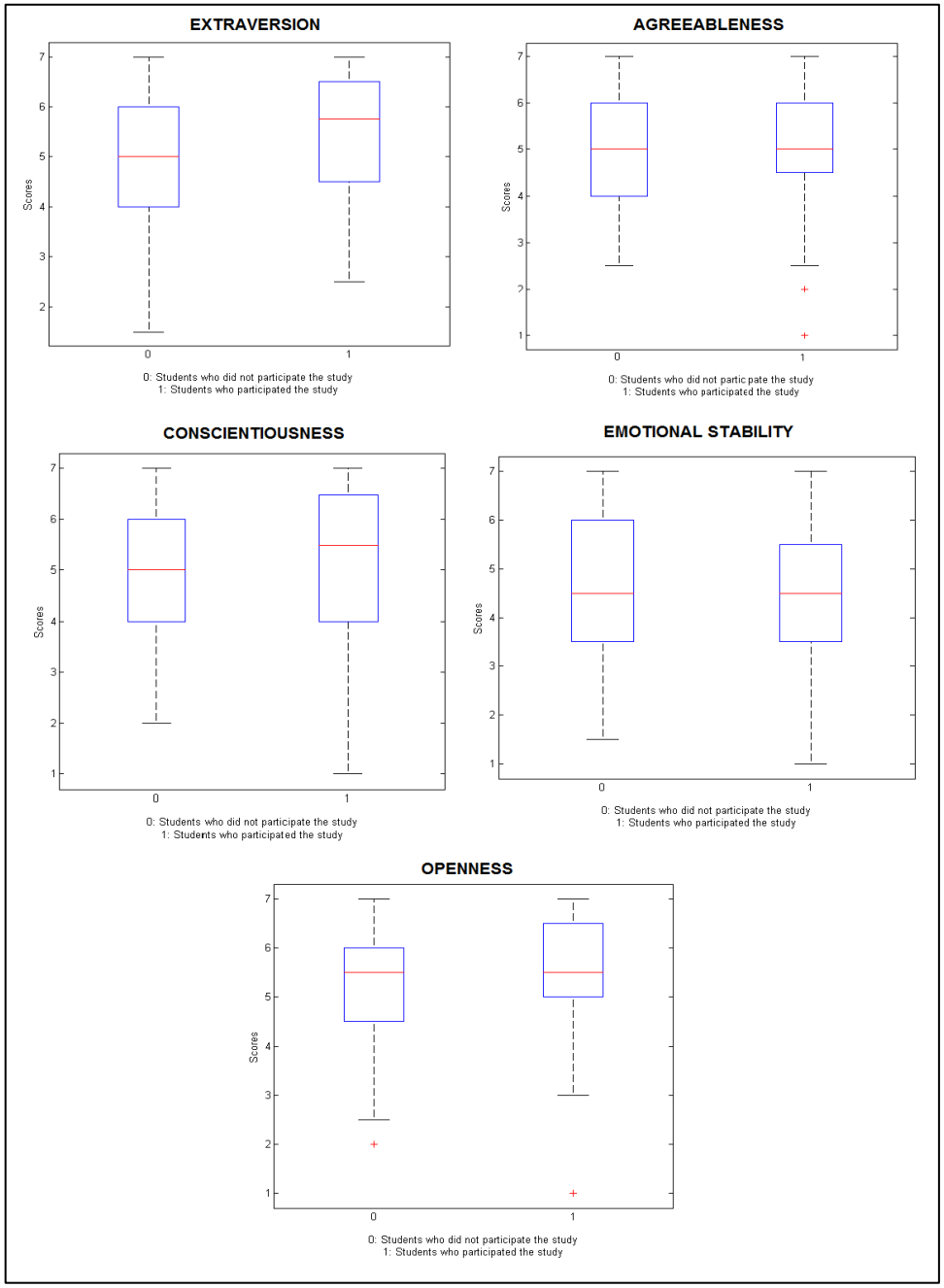
Appendix F: Scatter Plots of TIPI Items (Initial Case)



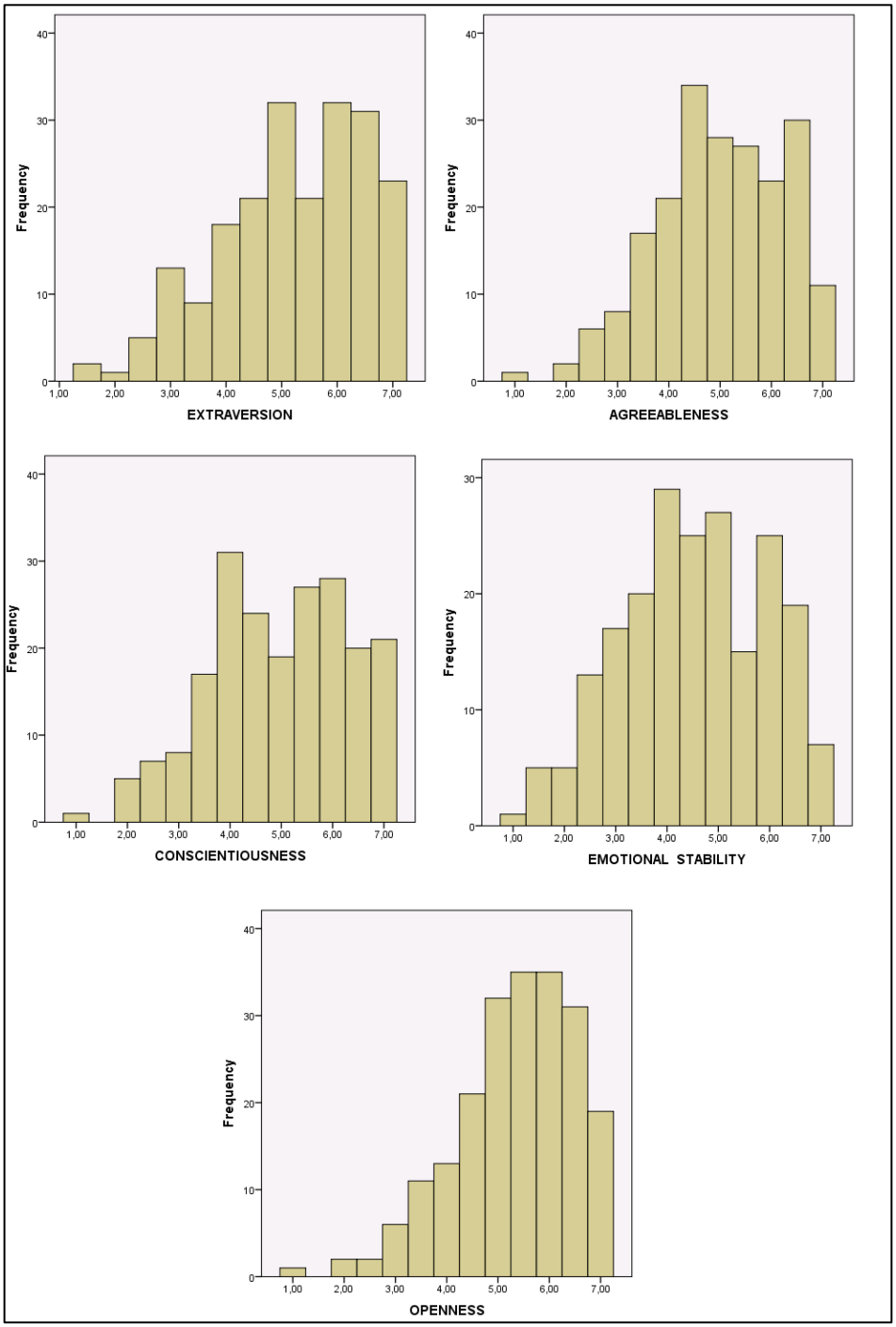
Appendix G: Scatter Plots of Test-Retest Reliability for Personality Traits



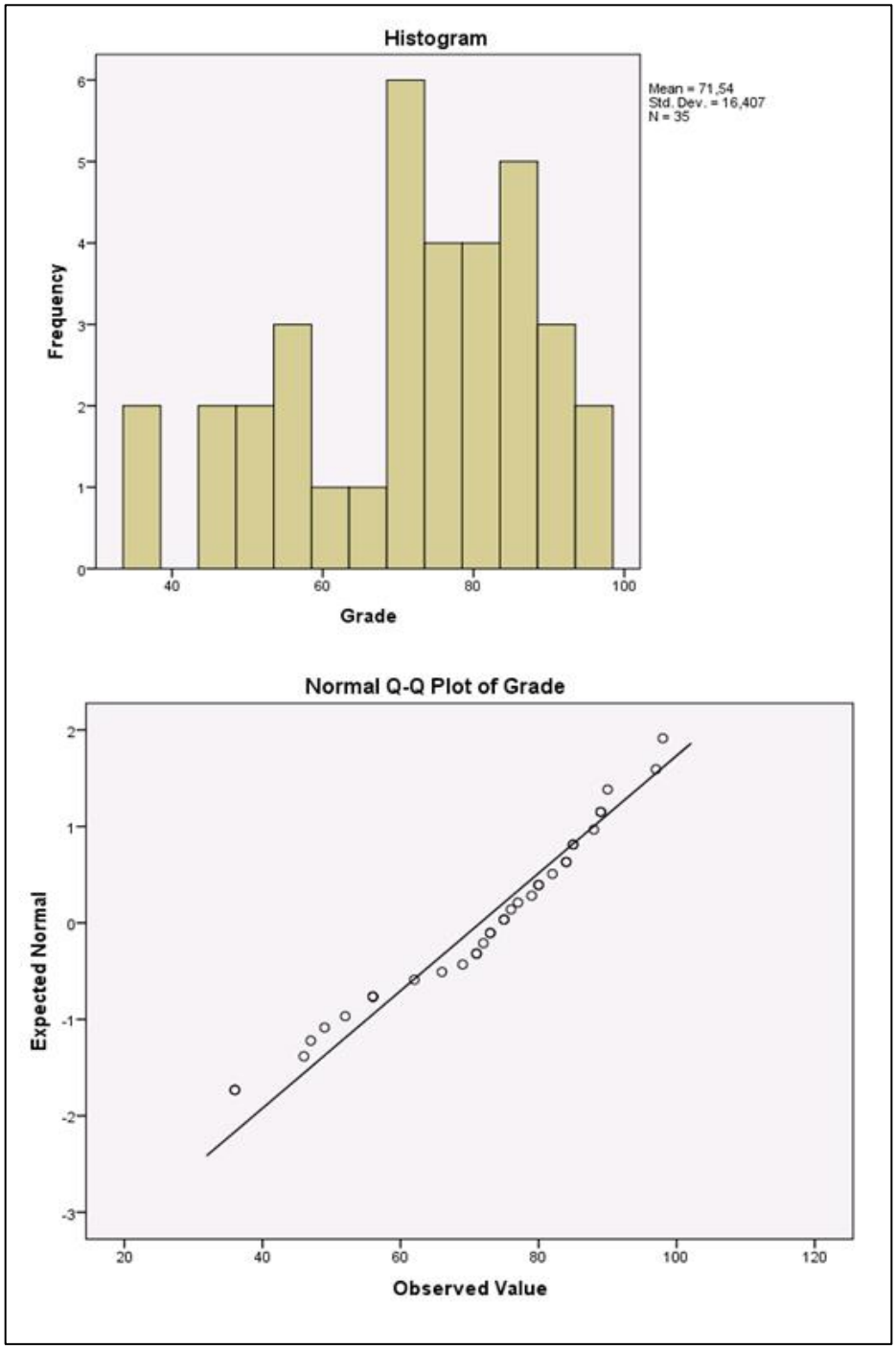
Appendix H: Boxplots for Trait Scores of the Participants and Non-Participants



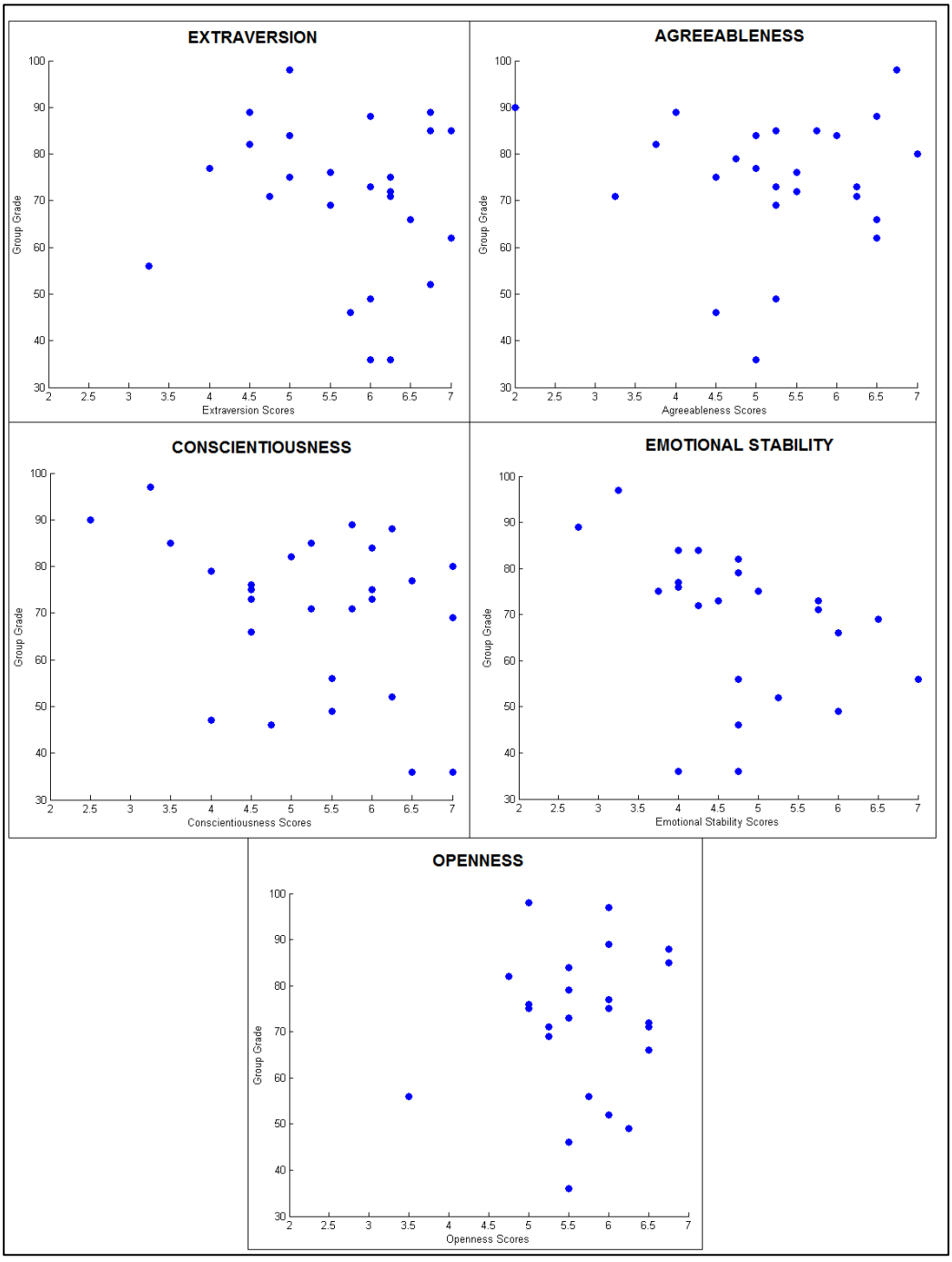
Appendix I: Histograms of Trait Scores



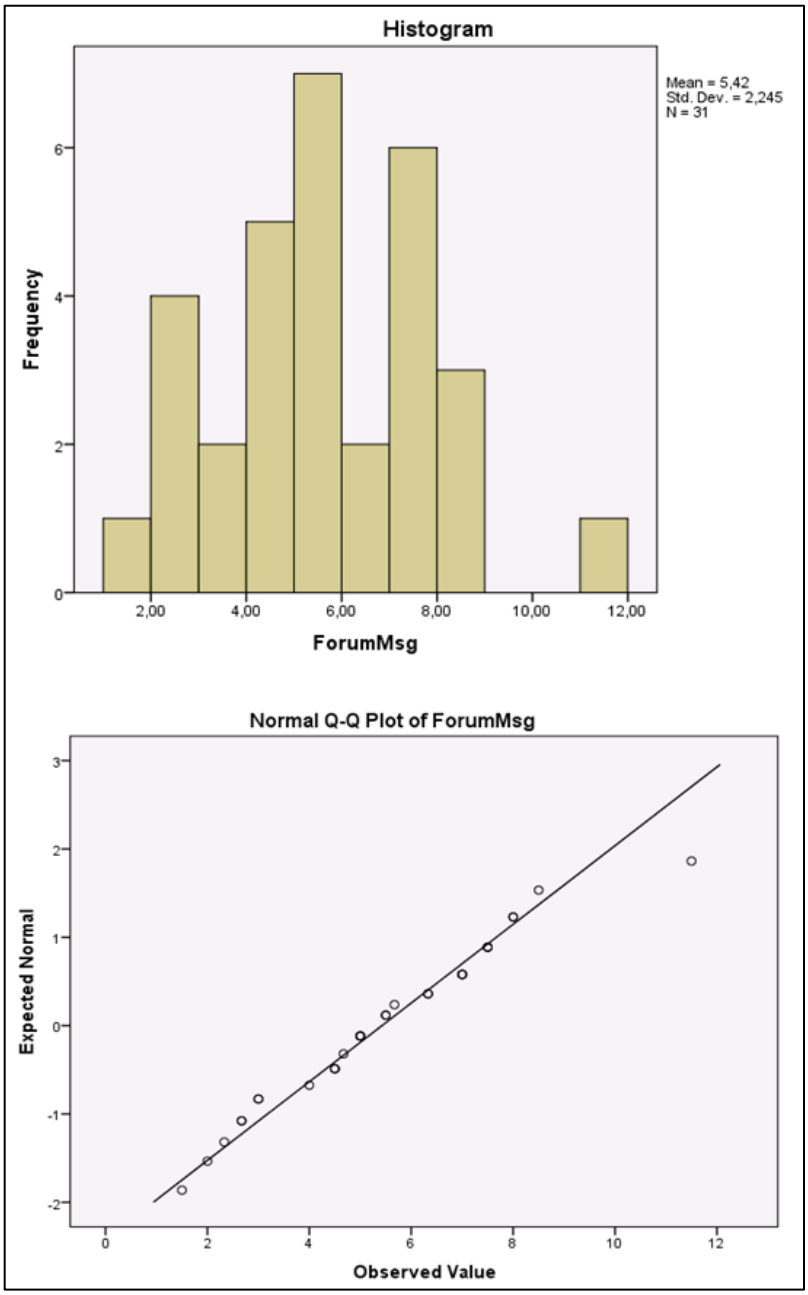
Appendix J: Histogram and Q-Q Plot for the Group Grades



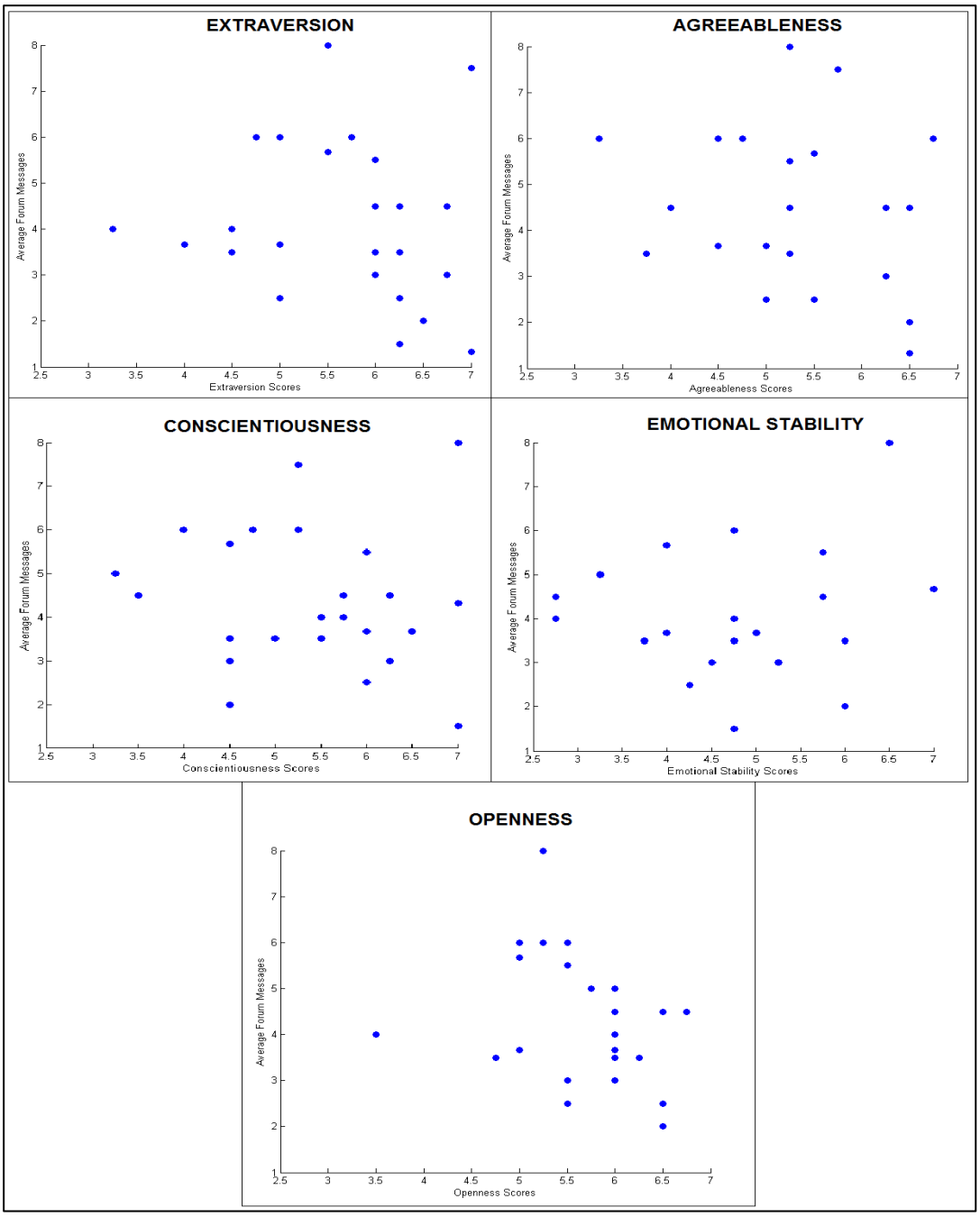
Appendix K: Scatter Plots of Personality Traits and Group Grades



Appendix L: Histogram and Q-Q Plot for the Average Number of Forum Messages



Appendix M: Scatter Plots of Personality Traits and Average Number of Forum Messages



Appendix N: Cross-Tabulation Table between Personality Traits and Influence Rates

			INFLUENCE		Total
			Not Most Influential	Most Influential	
EXT.	Not Most Extravert	Count	16	7	23
		% within EXT.	69.60%	30.40%	100.00%
		% within INFLUENCE	69.60%	46.70%	60.50%
	Most Extravert	Count	7	8	15
		% within EXT.	46.70%	53.30%	100.00%
		% within INFLUENCE	30.40%	53.30%	39.50%
	Total	Count	23	15	38
		% within EXT.	60.50%	39.50%	100.00%
		% within INFLUENCE	100.00%	100.00%	100.00%
AGR.	Not Most Agreeable	Count	15	9	24
		% within AGR.	62.50%	37.50%	100.00%
		% within INFLUENCE	62.50%	52.90%	58.50%
	Most Agreeable	Count	9	8	17
		% within AGR.	52.90%	47.10%	100.00%
		% within INFLUENCE	37.50%	47.10%	41.50%
	Total	Count	24	17	41
		% within AGR.	58.50%	41.50%	100.00%
		% within INFLUENCE	100.00%	100.00%	100.00%
CONS.	Not Most Conscientious	Count	12	9	21
		% within CONS.	57.10%	42.90%	100.00%
		% within INFLUENCE	60.00%	69.20%	63.60%
	Most Conscientious	Count	8	4	12
		% within CONS.	66.70%	33.30%	100.00%
		% within INFLUENCE	40.00%	30.80%	36.40%
	Total	Count	20	13	33
		% within CONS.	60.60%	39.40%	100.00%
		% within INFLUENCE	100.00%	100.00%	100.00%

			INFLUENCE		Total
			Not Most Influential	Most Influential	
EMO. STA.	Not Most Emotional Stable	Count	16	6	22
		% within EMO. STA.	72.70%	27.30%	100.00%
		% within INFLUENCE	72.70%	42.90%	61.10%
	Most Emotional Stable	Count	6	8	14
		% within EMO. STA.	42.90%	57.10%	100.00%
		% within INFLUENCE	27.30%	57.10%	38.90%
	Total	Count	22	14	36
		% within EMO. STA.	61.10%	38.90%	100.00%
		% within INFLUENCE	100.00%	100.00%	100.00%
OPEN.	Not Most Open	Count	14	9	23
		% within OPEN.	60.90%	39.10%	100.00%
		% within INFLUENCE	58.30%	56.20%	57.50%
	Most Open	Count	10	7	17
		% within OPEN.	58.80%	41.20%	100.00%
		% within INFLUENCE	41.70%	43.80%	42.50%
	Total	Count	24	16	40
		% within OPEN.	60.00%	40.00%	100.00%
		% within INFLUENCE	100.00%	100.00%	100.00%

Appendix O: Cross-Tabulation for Initiator, Submitter and Influential Students

			INFLUENCE		Total
			Not Most Influential	Most Influential	
INITIATOR	Not Initiator	Count	22	6	28
		% within INITIATOR	78.6%	21.4%	100.0%
		% within INFLUENCE	84.6%	33.3%	63.6%
	Initiator	Count	4	12	16
		% within INITIATOR	25.0%	75.0%	100.0%
		% within INFLUENCE	15.4%	66.7%	36.4%
Total		Count	26	18	44
		% within INITIATOR	59.1%	40.9%	100.0%
		% within INFLUENCE	100.0%	100.0%	100.0%

			INFLUENCE		Total
			Not Most Influential	Most Influential	
SUBMITTER	Not Submitter	Count	22	5	27
		% within SUBMITTER	81.5%	18.5%	100.0%
		% within INFLUENCE	84.6%	27.8%	61.4%
	Submitter	Count	4	13	17
		% within SUBMITTER	23.5%	76.5%	100.0%
		% within INFLUENCE	15.4%	72.2%	38.6%
Total		Count	26	18	44
		% within SUBMITTER	59.1%	40.9%	100.0%
		% within INFLUENCE	100.0%	100.0%	100.0%

			SUBMITTER		Total
			Not Submitter	Submitter	
INITIATOR	Not Initiator	Count	21	7	28
		% within INITIATOR	75.0%	25.0%	100.0%
		% within SUBMITTER	77.8%	41.2%	63.6%
	Initiator	Count	6	10	16
		% within INITIATOR	37.5%	62.5%	100.0%
		% within SUBMITTER	22.2%	58.8%	36.4%
Total		Count	27	17	44
		% within INITIATOR	61.4%	38.6%	100.0%
		% within SUBMITTER	100.0%	100.0%	100.0%

Appendix P: Cross-Tabulation Table between Personality Traits and Strategists

			STRATEGIST		
			Not Strategist	Strategist	Total
EXT.	Not Most Extravert	Count	27	10	37
		% within EXT.	72.97%	27.03%	100.00%
		% within STRATEGIST	71.05%	33.33%	54.41%
	Most Extravert	Count	11	20	31
		% within EXT.	35.48%	64.52%	100.00%
		% within STRATEGIST	28.95%	66.67%	45.59%
	Total	Count	38	30	68
		% within EXT.	55.88%	44.12%	100.00%
		% within STRATEGIST	100.00%	100.00%	100.00%
AGR.	Not Most Agreeable	Count	22	16	38
		% within AGR.	57.89%	42.11%	100.00%
		% within STRATEGIST	53.66%	48.48%	51.35%
	Most Agreeable	Count	19	17	36
		% within AGR.	52.78%	47.22%	100.00%
		% within STRATEGIST	46.34%	51.52%	48.65%
	Total	Count	41	33	74
		% within AGR.	55.41%	44.59%	100.00%
		% within STRATEGIST	100.00%	100.00%	100.00%
CONS.	Not Most Conscientious	Count	18	17	35
		% within CONS.	51.43%	48.57%	100.00%
		% within STRATEGIST	50.00%	60.71%	54.69%
	Most Conscientious	Count	18	11	29
		% within CONS.	62.07%	37.93%	100.00%
		% within STRATEGIST	50.00%	39.29%	45.31%
	Total	Count	36	28	64
		% within CONS.	56.25%	43.75%	100.00%
		% within STRATEGIST	100.00%	100.00%	100.00%

			STRATEGIST		
			Not Strategist	Strategist	Total
EMO. STA.	Not Most Emotional Stable	Count	24	14	38
		% within EMO. STA.	63.16%	36.84%	100.00%
		% within STRATEGIST	58.54%	43.75%	52.05%
	Most Emotional Stable	Count	17	18	35
		% within EMO. STA.	48.57%	51.43%	100.00%
		% within STRATEGIST	41.46%	56.25%	47.95%
	Total	Count	41	32	73
		% within EMO. STA.	56.16%	43.84%	100.00%
		% within STRATEGIST	100.00%	100.00%	100.00%
OPEN.	Not Most Open	Count	25	9	34
		% within OPEN.	73.53%	26.47%	100.00%
		% within STRATEGIST	71.43%	32.14%	53.97%
	Most Open	Count	10	19	29
		% within OPEN.	34.48%	65.52%	100.00%
		% within STRATEGIST	28.57%	67.86%	46.03%
	Total	Count	35	28	63
		% within OPEN.	55.56%	44.44%	100.00%
		% within STRATEGIST	100.00%	100.00%	100.00%

Appendix R: Frequency Tables of Personality Traits

EXTRAVERSION

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	7	3.4	3.4	3.4
	2	39	19.1	19.1	22.5
	3	71	34.8	34.8	57.4
	4	87	42.6	42.6	100.0
	Total	204	100.0	100.0	

AGREEABLENESS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	51	25.0	25.0	25.0
	2	63	30.9	30.9	55.9
	3	50	24.5	24.5	80.4
	4	40	19.6	19.6	100.0
	Total	204	100.0	100.0	

CONSCIENTIOUSNESS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	67	32.8	32.8	32.8
	2	44	21.6	21.6	54.4
	3	74	36.3	36.3	90.7
	4	19	9.3	9.3	100.0
	Total	204	100.0	100.0	

EMOTIONAL STABILITY

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	40	19.6	19.6	19.6
	2	73	35.8	35.8	55.4
	3	66	32.4	32.4	87.7
	4	25	12.3	12.3	100.0
	Total	204	100.0	100.0	

OPENNESS

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	33	16.2	16.2	16.2
	2	56	27.5	27.5	43.6
	3	69	33.8	33.8	77.5
	4	46	22.5	22.5	100.0
	Total	204	100.0	100.0	

Appendix S: Cross-Tabulation Table between Personality Traits and Social Media Use

			SOC. MED. USE				
			1	2	3	4	Total
EXT.	2	Count	24	12	6	4	46
		% within EXT.	52.2%	26.1%	13.0%	8.7%	100.0%
		% within SOC. MED. USE	31.2%	20.7%	14.3%	14.8%	22.5%
	3	Count	24	24	14	9	71
		% within EX	33.8%	33.8%	19.7%	12.7%	100.0%
		% within SOC. MED. USE	31.2%	41.4%	33.3%	33.3%	34.8%
	4	Count	29	22	22	14	87
		% within EXT.	33.3%	25.3%	25.3%	16.1%	100.0%
		% within SOC. MED. USE	37.7%	37.9%	52.4%	51.9%	42.6%
Total		Count	77	58	42	27	204
		% within EXT.	37.7%	28.4%	20.6%	13.2%	100.0%
		% within SOC. MED. USE	100.0%	100.0%	100.0%	100.0%	100.0%
AGR.	1	Count	22	14	9	6	51
		% within AGR.	43.1%	27.5%	17.6%	11.8%	100.0%
		% within SOC. MED. USE	28.6%	24.1%	21.4%	22.2%	25.0%
	2	Count	22	16	14	11	63
		% within AGR.	34.9%	25.4%	22.2%	17.5%	100.0%
		% within SOC. MED. USE	28.6%	27.6%	33.3%	40.7%	30.9%
	3	Count	18	16	11	5	50
		% within AGR.	36.0%	32.0%	22.0%	10.0%	100.0%
		% within SOC. MED. USE	23.4%	27.6%	26.2%	18.5%	24.5%
	4	Count	15	12	8	5	40
		% within AGR.	37.5%	30.0%	20.0%	12.5%	100.0%
		% within SOC. MED. USE	19.5%	20.7%	19.0%	18.5%	19.6%
Total		Count	77	58	42	27	204
		% within AGR.	37.7%	28.4%	20.6%	13.2%	100.0%
		% within SOC. MED. USE	100.0%	100.0%	100.0%	100.0%	100.0%

			SOC. MED. USE. MED. USE				
			1	2	3	4	Total
CONSCIENTIOUSNESS	1	Count	27	18	11	11	67
		% within CONS	40.3%	26.9%	16.4%	16.4%	100.0%
		% within SOC. MED. USE	35.1%	31.0%	26.2%	40.7%	32.8%
	2	Count	19	13	6	6	44
		% within CONS	43.2%	29.5%	13.6%	13.6%	100.0%
		% within SOC. MED. USE	24.7%	22.4%	14.3%	22.2%	21.6%
	3	Count	22	23	23	6	74
		% within CONS	29.7%	31.1%	31.1%	8.1%	100.0%
		% within SOC. MED. USE	28.6%	39.7%	54.8%	22.2%	36.3%
	4	Count	9	4	2	4	19
		% within CONS	47.4%	21.1%	10.5%	21.1%	100.0%
		% within SOC. MED. USE	11.7%	6.9%	4.8%	14.8%	9.3%
Total		Count	77	58	42	27	204
		% within CONS	37.7%	28.4%	20.6%	13.2%	100.0%
		% within SOC. MED. USE	100.0%	100.0%	100.0%	100.0%	100.0%
EMOTIONAL STABILITY	1	Count	14	16	4	6	40
		% within EMO	35.0%	40.0%	10.0%	15.0%	100.0%
		% within SOC. MED. USE	18.2%	27.6%	9.5%	22.2%	19.6%
	2	Count	25	21	16	11	73
		% within EMO	34.2%	28.8%	21.9%	15.1%	100.0%
		% within SOC. MED. USE	32.5%	36.2%	38.1%	40.7%	35.8%
	3	Count	27	16	17	6	66
		% within EMO	40.9%	24.2%	25.8%	9.1%	100.0%
		% within SOC. MED. USE	35.1%	27.6%	40.5%	22.2%	32.4%
	4	Count	11	5	5	4	25
		% within EMO	44.0%	20.0%	20.0%	16.0%	100.0%
		% within SOC. MED. USE	14.3%	8.6%	11.9%	14.8%	12.3%
Total		Count	77	58	42	27	204
		% within EMO	37.7%	28.4%	20.6%	13.2%	100.0%
		% within SOC. MED. USE	100.0%	100.0%	100.0%	100.0%	100.0%

			SOC. MED. USE. MED. USE				
			1	2	3	4	Total
OPENNESS	1	Count	19	8	5	1	33
		% within OPEN	57.6%	24.2%	15.2%	3.0%	100.0%
		% within SOC. MED. USE	24.7%	13.8%	11.9%	3.7%	16.2%
	2	Count	23	17	9	7	56
		% within OPEN	41.1%	30.4%	16.1%	12.5%	100.0%
		% within SOC. MED. USE	29.9%	29.3%	21.4%	25.9%	27.5%
	3	Count	20	21	13	15	69
		% within OPEN	29.0%	30.4%	18.8%	21.7%	100.0%
		% within SOC. MED. USE	26.0%	36.2%	31.0%	55.6%	33.8%
	4	Count	15	12	15	4	46
		% within OPEN	32.6%	26.1%	32.6%	8.7%	100.0%
		% within SOC. MED. USE	19.5%	20.7%	35.7%	14.8%	22.5%
	Total	Count	77	58	42	27	204
		% within OPEN	37.7%	28.4%	20.6%	13.2%	100.0%
		% within SOC. MED. USE	100.0%	100.0%	100.0%	100.0%	100.0%

Appendix T: Normative Data for the TIPI (Adapted from Gosling et al., 2003)

	Ext.	Agr.	Cons.	Emo. Sta.	Open.
Mean	4.44	5.23	5.40	4.83	5.38
Std. Dev.	1.45	1.11	1.32	1.42	1.07