EXPLAINING THE FACTORS ASSOCIATED WITH THE LIKELIHOOD OF
ACADEMIC RESILIENCE IN SCIENCE AND MATHEMATICS LITERACIES
IN PISA 2012

A MASTER'S THESIS

BY

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THE PROGRAM OF CURRICULUM AND INSTRUCTION
İHSAN DOĞRAMACI BILKENT UNIVERSITY
ANKARA

MAY 2017

Çok sevgili annem Fatma Aydın ve abim Burak Aydın'a…

Explaining the Factors Associated with the Likelihood of Academic Resilience in

Science and Mathematics Literacies in Pisa 2012

The Graduate School of Education

of

İhsan Doğramacı Bilkent University

by

Burçak Gönül Aydın

In Partial Fulfillment of the Requirements for the Degree of

Master of Arts

in

The Program of Curriculum and Instruction

Ankara

May 2017

İHSAN DOĞRAMACI BILKENT UNIVERSITY
GRADUATE SCHOOL OF EDUCATION

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May 2017

I certify that I have read this thesis and have found that it is fully adequate, in scope

and in quality, as a thesis for the degree of Master of Arts in Curriculum and

Instruction.

Asst. Prof. Dr. İlker Kalender (Supervisor)

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ABSTRACT

EXPLAINING THE FACTORS ASSOCIATED WITH THE LIKELIHOOD OF
ACADEMIC RESILIENCE IN SCIENCE AND MATHEMATICS LITERACIES
IN PISA 2012

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M.A., Program of Curriculum and Instruction
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May 2017

This study investigated teacher- and school-related factors which affect science and
mathematics achievement of the students who have a socio-economically
disadvantaged background in Turkey. A segmentation method was used to find the
relationship between teacher-and school-related factors and academic achievement in
science and mathematics literacies. The sample consisted of 1200 low-SES students.
Seven dimensions of PISA 2012 student questionnaire including 38 items were used
to determine the students' attitudes towards learning activities and their outcomes in
school, perceptions of the students for the student-teacher relationship, sense of
belonging to school. The analysis showed that being a resilient student or a low-
achiever could be explained with investigating some of these items. The study results
provide an insight into designing educational policies to enhance resilience of socio-
economically disadvantaged students.

Key words: Academic resilient students, socio-economic status, achievement,
literacy

ÖZET

YILMAZLIK GÖSTEREN ÖĞRENCİLERİN PISA 2012'DEKİ FEN VE
MATEMATİK OKURYAZARLIK BAŞARI FARKLARINA NEDEN
OLABİLECEK FAKTÖRLERİN AÇIKLANMASI

Burçak Gönül Aydın

Yüksek Lisans, Eğitim Programları ve Öğretim
Tez Yöneticisi: Yrd. Doç. Dr. İlker Kalender

Mayıs 2017

Bu çalışmanın amacı, Türkiye'de sosyoekonomik açıdan dezavantajlı öğrencilerin
fen ve matematik okuryazarlık alanlarında başarılarını etkileyen okul ve öğretmenle
ilgili faktörleri incelemektir. Bir kümeleme yöntemi kullanılarak, fen ve matematik
okuryazarlığı ile okul ve öğretmenle ilgili faktörleri arasında nasıl bir ilişki olduğunu
araştırmak hedeflemiştir. Örneklem, 1200 düşük sosyo ekonomik düzeyli
öğrencilerden oluşmaktadır. Öğrencilerin okula ve okuldaki öğrenmeye karşı
tutumları, öğretmenleriyle olan ilişkileri ve okula karşı aidiyet hislerini belirlemek
amacıyla PISA 2012 çalışmasının yedi altboyutunda toplam 38 maddeye verdikleri
cevaplar kullanılmıştır. Analiz sonuçları, seçilen maddelerin bazılarının dezavantajlı
öğrencilerin düşük başarı yada yılmazlık göstermesinde etkili olabileceğini
göstermiştir. Bu çalışmanın sonuçları dezavantajlı bir sosyoekonomik düzeyden
gelen öğrencilerin yılmazlığını artıracak eğitim politikaları planlamaya ışık tutacak
bilgiler sunmaktadır.

Anahtar kelimeler: Akademik yılmazlık gösteren öğrenciler, sosyoekonomik düzey,
başarı, okuryazarlık.

ACKNOWLEDGEMENTS

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CHAPTER 1: INTRODUCTION

Introduction

This study focuses on academic resilience and how resilient students cope academically and socially with the economic and social barriers in their lives. The factors which affect students during academic achievement was investigated. There are many students who come from low socio-economic background in Turkey and they, like any other students, all have the right to receive an education with high quality. The study on resilient students will close the gap in the literature. Although millions of students come from low social economic background, there are only a few studies about academic resilience in Turkey (MoNE, 2013).

Background

Human beings are born with vulnerable nature which is relatively incapacity of protecting their own interests. Vulnerable people may have insufficient power, intelligence, education, resources, and strengths (Vallotton, 2010). Furthermore, young people are more unguarded and unprotected because they still have to learn and attempt to alter life circumstances and experiences associated with stressors such as low-income parents, limited economic resources, and parent-adolescent conflict (Hall, Williams, & Greenberg, 1985). Those unguarded children and adolescents may also suffer from psychological and physical diseases because stressful life events are linked to negative mental health outcomes (Tennant & Andrews, 1978). In addition, financial difficulties and other outside pressures may affect young adults' mental health and academic performance (Andrews & Wilding, 2004).

In their study, Milam, Furr-Holden, and Leaf (2010) stated that community and school violence continue to be a major public health problem especially among urban children and adolescents in The United Kingdom. Community violence in school and social environment has an adverse impact on primary school children's academic performance; school violence has the same effect, as well (Milam et al., 2010; Rutter, 2012).

Among these stressors and challenges, low parental socio-economic status (SES) has a transgenerational continuity risk on academic achievement and standards of life (Birch & Gussow, 1970). People who are able to overcome those stressors are called resilience (Garmezy, 1991; Masten, 1994). Students who succeed in school despite their low-SES are called the resilient students (Benard, 1995). The resilient students are those who are able to develop social competence, to have problem-solving skills, and to possess autonomy and a sense of purpose (Rutter, 2012).

There are some factors associated with academic resilience (Luthar, 2006). For instance, a teacher's role is significantly related to students' achievement (Martin, 2002). An effective teacher gives a clear objective, presents a clear explanation of subjects, suggests a big attention to the student's accomplishment, provides information to the student to enhance their academic and social competence, orients students toward better appreciation for task-related behavior and problem solving, and encourages students to develop task-related skills (Brophy & Good,1984). Therefore, another important effect besides teacher is classroom climate which can be defined by phrases such as efficient resources, number of students in a classroom, and homogeneity of class (Koelger & Rincover, 1974). School and classroom

environment also have essential roles for the teachers to develop teaching skills for improving student learning and closing achievement gaps (McLaughlin & Talbert, 2006). In his pioneer research, Coleman (1966) stated that school factors related to school resources such as per pupil expenditure, school facilities, and number of books in the library is important on students' academic achievement (White, 1982). There are two main factors which are asserted to develop the quality of educational system: financial investment in education which is related to human capital (Burja & Burja, 2013) and cultural capital, which is related to social strengths of a person who can promote social mobility in a stratified society (Bourdieu, 1986).

Social capital is the relations based on trust among the people from the economic point of view (Karagul & Masca, 2005). In the educational context, a student is not only surrounded by family but also school, teachers, caring adults, and environment (Arastaman & Balcı). These factors have important effects on children and adolescent' for sociological and educational development (Hanewald, 2011). The PISA (The Programme for International Student Assessment) is research financed by The OECD (Organization of Economic Cooperation and Development) in order to measure and evaluate new functions of education. The PISA survey aims to investigate the capacity of students from participant countries who finish compulsory education in their country in order to take place in knowledge-based society (MoNE, 2016b). The PISA presents an index of economic, social, and cultural status (ESCS) which includes five indices: (1) highest occupational status of parents; (2) highest educational level of parents; (3) family wealth; (4) cultural possessions as number of books and paintings in the family home; (5) home educational resources such as study desk, internet access, and computer (OECD, 2013a).

Burja and Burja (2013) stated that there is a correlation between economic growth and educational systems in the countries because quality of human capital contributes sustainable economic growth by increasing knowledge and competence which address education and training systems. Cultural capital, a term first used by Bourdieu (1986), refers to the social aspects of a person in terms of education, intellectuality, and dressing. Cultural capital promotes a person's social mobility of a person in a stratified society (De Graaf, De Graaf, & Kraaykamp, 2000). It can exist in three-forms: (1) in the embodied state, which is the form of long-lasting dispositions of the mind and body; (2) in the objectified state which is the form of cultural goods such as pictures, books, dictionaries, instruments, and machines; (3) in the institutionalized state which is form of objectification related to educational qualification. In the current study, disadvantaged students are defined regarding their socio-economic status because cultural and educational sources have a major role to enhance students' achievement (White, 1982; Şirin, 2005). Thus, the terms low-SES and academic achievement bring the concept of resilience.

The concept of resilience has been one of the most important concepts which have been studied in social sciences (Luthar, 2006). In the literature, the term resilience was first defined in the Coleman Report on equality of educational opportunity in 1966. This study investigated the relationship between students' success and school environment. There was a significant difference in levels of achievement between the students who study at the high schools with higher-paid teachers, laboratory facilities, and lots of books in the school library and the students who study at the high schools with lower-paid teachers and no access for library or laboratory (Darling-Hammond, 2000). This group of students had the same levels of academic

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achievement in the primary school but inequity between the groups caused achievement difference (Coleman, 1966). Physical conditions of home, neighborhood, and peer environment were the factors that formed inequalities at the end of school life and lasted throughout life (White, 1982; Şirin, 2005).

Resilience also can be defined as reduced vulnerability to environmental risks and relatively good outcomes despite risk experiences (Rutter, 2012). In order to be defined as resilient, the individuals should have two judgments: first, there should be a high-risk status such as the individual that has a family in poverty or parents at a low academic level; second, the individual has a high adaptation capacity to school or environment (Masten & Coatsworth, 1998).

Resilient children are the individuals who overcome the disadvantages that are stated as internal and external protective factors in the literature. These factors are also named as coping factors or protective mechanisms. The profile of a resilient child includes having highly developed problem-solving skills, considering a realistic future plan, possessing a positive sense of being able to achieve the task, experiencing success in many areas in their lives, and having good communication skills with peers and adults (Oswald, Johnson, & Howard, 2003). Regardless of stressful experiences, such as low parental quality or family socioeconomic resources, some predictors such as good intellectual skills have more effect on the academic achievement (Masten, Powell, & Luthar, 2003). Academic resilient students have success in school while their peers who come from the same low socioeconomic backgrounds do not (Martin, 2002). Resiliency may significantly affect school and social outcomes for adolescents and can be learned and measured.

Resilient students have academic confidence, a sense of well-being and self-esteem, motivation to succeed, the ability to set goals, strong connections with peers and adults, the ability to handle stress, and have high attendance rate at school (Bandura, 1984). In the PISA tests, there is significant number of disadvantaged students who scored high above the mean of the OECD (OECD, 2013b).

The PISA is an international survey which is conducted every three years and aims to evaluate education systems worldwide by the test for the skills and knowledge of 15-year-old students. The students represent more than 70 economies have participated in this assessment since 2000. The last assessment was conducted in 2012. Nearly 510,000 students from 65 economies took the PISA 2012 assessment of reading, mathematics and science representing around 28 million 15-year-olds globally. Forty-four economies took part in an assessment of creative problem solving and 18 economies in an assessment of financial literacy (OECD, 2012a).

A big portion of Turkish disadvantaged students scored well in the PISA cycles. Having a high ratio of academic resilient students is an exemplary situation which provides an opportunity to study at-risk Turkish students based on quantitative data sets (MoNE, 2013). In the PISA, a resilient student is the one who performs much better than her or his peers coming from the same low socio-economic background. In other words, a resilient student in a country performs higher than the PISA average among the students coming from the bottom quarter of socio-economic background in each country (OECD, 2012a). There are many factors associated with resiliency as stated above but SES is probably the most important factor. SES is defined with three major factors: (1) family income; (2) parents' educational level;

and (3) parents' occupation because family income directly affects the quality of housing, mobility, and amount of travelling.

The students' socio-economic background and academic achievement have a significant correlation (Şirin, 2005; White, 1982). Figure 1 presents the performance of students with respect to socio-economic status within the years.

	Bottom Quarter	Second Quarter	Third Quarter	Top Quarter
2003	374	395	429	496
2012	412	436	447	498
2015	398	409	421	456
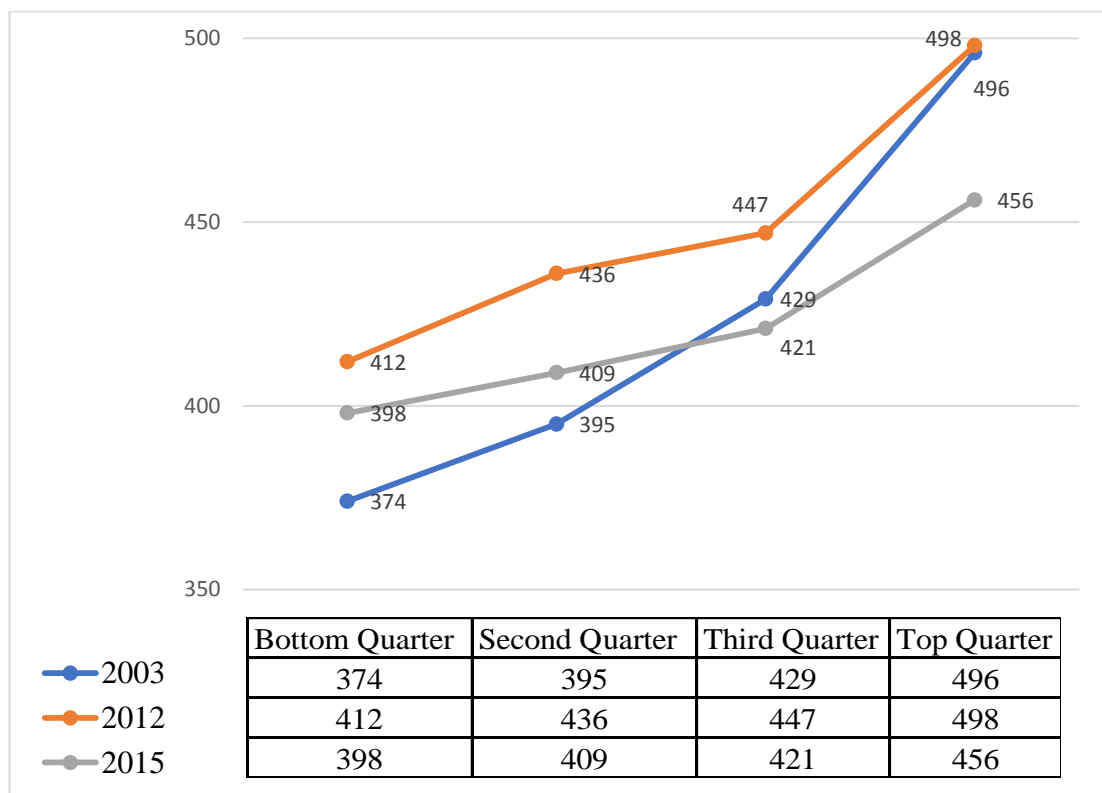
Figure 1.The average of students in Turkey in PISA 2003, PISA 20012, and PISA 2015 accounting for their SES

Source: Ministry of Education, PISA National Report 2013 and PISA National Report 2015.

Problem

Identification of factors associated with student achievement for resilience is one of the most important research areas in educational sciences. Many studies can be found in the literature regarding these factors. However, the question as discriminating

factors between students who are academic resilience and is yet not answered. In other words, the factors associated with academic resilience among low-SES students with respect to students' perception should be determined. Turkey has lower ranks than most of the participating counties in the PISA in science, literacy, and mathematics but the ratio of resilient students is significantly higher than the average of the PISA. Thus, Turkish students constitute a prime sample for this topic.

Purpose

In Turkey, there are only a few studies about academic resilience despite thousands of students who come from low social economic background. Prior research has shown that school environment and teacher factors are commonly used to discriminate relationship between resilient and low-achieving students (Yılmaz-Fındık & Kavak, 2013). Nonetheless, the relationship between key factors and students' academic achievement levels needs further examination related to students' perception. The primary purpose of the present study is to determine teacher- and school-related factors with respect to the participant students' perception.

The study aims to distinguish between low-SES/low-achieving and resilient students using the data set of PISA 2012 focusing on mathematics and science subject areas because the PISA tests assess how students apply their knowledge and concepts to real-life situations. In order to identify the associated factors of being resilient in mathematics and science, a segmentation approach will be used. Several students' clusters will be defined. The cluster with a higher number of resilient students regarding the whole sample will be specifically focused upon to reveal information about discriminating factors.

Research question

The research question of the study was as follows:

What are student profiles that are associated with likelihood of academic resilience in science and mathematics literacies based on PISA 2012?

Significance

The results of the study may have educational stakeholders as school administrators, teachers, and educational policy makers in Turkey's Ministry of National Education. With the help of this study, these stakeholders will be able to elaborate the applicable strategies to promote the possibility of being an academic resilient student.

If these factors have an effect on student achievement, then students can be better supported to reach higher levels of academic achievement by encouraging teachers to be more interested in students by giving extra supports to low-SES students, making better schools environments, and increasing the support of parents.

Definition of key terms

Resilience: a set of characteristics of the individuals that help to overcome adversities in their lives (Benard, 1995). The term resilience was defined as the process of the capacity for the outcome of successful adaptation despite the challenging environment and risk family factors (Howard & Johnson, 2000).

Academic resilience: the capacity of an individual to have high levels of achievement, motivation, and performance despite living at risk and facing with stressful events (Rutter, 2012). Academic resilience also is defined with five factors

as self-efficacy, control, planning, low anxiety, persistence, hope and problem solving skills (Martin & Marsh, 2006).

Mathematics literacy: the capacity of the students to solve, analyze, formulate, and interpret mathematical problems in a variety of situations (OECD, 2013c). Mathematics literacy also is defined as students' ability to understand the role of mathematics in the world and to engage and involve mathematics in their lives as constructive and reflective citizen (Cresswell & Vayssettes, 2006).

Science literacy: the ability of an individual to identify questions, to describe scientific phenomena, to use scientific knowledge for understanding the science hidden in the natural world, and to have an awareness of how science and technology form our cultural and material environments (Cresswell & Vayssettes, 2006).

Perseverance: persistent students who hardly give up in doing something despite difficulties in achieving academic success (Duckworth, Peterson, Matthews, & Kelly, 2007). Howe (2001) stated that high academic achievement is directly related to mental ability and perseverance is as essential as intelligence.

CHAPTER 2: REVIEW OF RELATED LITERATURE

Introduction

In this chapter, the literature of resilience and academic resilience is reviewed with respect to risk and protective factors. The terms disadvantaged students and resilient students are defined and the factors that resilient students cope with are investigated. Academic resiliency and psychological resiliency have a very strong relationship. Academic resilient students also have a positive perspective and self-confidence to overcome the barriers. They have an internal locus of control taking personal responsibilities in their success and failure (McMillan & Reed, 1994). In the literature review, the history of the concept of academic resiliency and how to develop resilience to help the children and young adults to adapt their schools and communities were reviewed. The studies show that there is a significant relationship between students' achievement and school factors regarding teachers' attitude, school environment, and extracurricular activities.

The present study investigates main risk and protective factors that affect low-SES students to be resilient. Turkey is an exemplary country for resilience because 69% of students are at the bottom quarter of the socio-economic background index (ESCS) (MoNE, 2013). Thus, it is normal that the number of resilient students in Turkey is above the OECD average (OECD, 2013b). Turkish students have the potential to be resilient with this great number of disadvantaged students.

The school conditions and teachers' support also are the protective factors that can be developed in a certain time and help students overcome the difficulties but it not easy to change family factor and environment atmosphere.

Social capital theory

In the theory, social capital relates to institutions, attitudes, and values which control interactions among people (Grootaert & Van Bastelaer, 2002). The social capital framework fits into such capital-based theories. For instance, financial capital is related to income and wealth; human capital includes level of education and socio-economic status, and cultural capital incorporates cultural knowledge and experiences. Therefore, social capital is the term used to describe levels of economic development and well-being of individuals in sociology (Bourdieu, 1986).

According to Coleman (1966), social capital is the source of understanding the factors which describe academic achievement. Since children and adolescents are encompassed by family, school, and environment, these factors inevitably affect students' academic performance. In other words, family and school social capitals have the effects on students' academic achievement.

In addition, parental involvement in schools is one of the positive effects on students' achievement (Hill & Taylor, 2004; Hill & Tyson, 2009). Coleman also emphasizes the importance of closure for effective parental guidance (Portes, 2000). Closure is the form of social capital which is about how good parents know friends of their children and parents of these friends (Coleman, 1988). In educational settings, structural social capital in the school is related to class size, the region where the school is located, type of school, and school ownership (Alacacı & Erbaş, 2010).

The functional social capital of schools is decision-making structures and locus of long-range planning power (Lee, 1979; Bassani, 2007).

Education and social mobility

Social mobility is defined as the differences in social achievement in accordance with social background (Boudon, 1974). Haveman and Smeeding (2006) states that students who come from a low-income family have a lower level of educational attainment than the students from a high-income family. They find that high-income families make a significant effort to prepare their children for American's top colleges, so the majority of students in top colleges are children of high-income families. In another study, children of the working-class have a tendency to choose technical fields of study; children of the self-employed or of small employers want financial competence to take over the business; children of farmers want to be farmers, and children of the service-class tend to study in prestigious fields as law and medicine (Van de Werfhorst, 2002). This study supports, that only children of the service-class have the sense of vertical mobility. Social class influences a person's chance of social mobility. In a fluid society, individuals are allowed to move vertically from one status to another one in a socio-professional environment (Kaufmann & Montulet, 2008).

In order to reduce or end the upward immobility of the individuals from low-SES, the school climate should evolve because education provides more chances for individuals in developing countries like Turkey (Fitzpatrick, 2002; Haveman & Smeeding, 2006).

Disadvantaged students

The term advantaged generally refers to a poor family or parents with lower education and the member of a group who suffers from different economic and social adversities (Arastaman & Balcı, 2013). Half of all adolescents are at the risk factors such as poverty, living with single or psychologically ill parents, and poor language skills as school language is not students' native language (Catterall, 1998).

The sequence of damaging events such as war has occurred at the beginning of the 21st century and these events affect a large number of people who suffered in war and natural disasters. These adversities have laid groundwork for apprehensions about the children of the world who are the future of the societies (Luthar, 2006). After World War II, the term resilience became a current issue in educational science because many children died and millions of surviving children had to face the calamity conditions such as being orphaned, injured or disabled (Masten, 2014). Millions of children who experienced the consequences of the war had to live in homeless shelters or refugee camps (Masten et al., 2003).

Disadvantaged children are surrounded by many stressful experiences (Martin, 2002); they are not exposed to only a single problem because risk factors co-occur with other risk factors (Alva, 1991; Masten, 1994; Masten et al., 2003). In order to consider the features of resilience in an individual, there must be positive results in a situation which involves high risk such as scoring higher marks at school (Brackenreed, 2010).

Investment in education and economic growth

National income increases when the acquisition of personal human capital builds individual economic growth (Mincer, 1984). The increase in income is a clue of understanding the relationship between investment in education and economic growth (Burja & Burja, 2013). Moreover, highly educated or better trained individuals are more creative and productive than poorly trained or less educated individuals (Jorgenson & Fraumeni, 1992). Since the impact of human capital on economic growth is nonlinear, the contribution of investment in education to the growth per capita income can be observed in long-term growth (Savvides, & Stengos, 2008).

The role of socioeconomic status on students' achievement

Education in a changing and developing world should be formed and designed using information and transferring knowledge into real life events and issues (Bourdieu, 1986). SES has important implications on students' academic achievement (Şirin, 2005). Lower-SES students have challenges to close the gap with students coming from higher-SES. For instance, lower-SES children fall behind the higher-SES children in communication and interpersonal skill areas by ages 3 and 4 (Verdine, Irwin, Golinkoff & Hirsh-Pasek, 2014). In addition, an individual who is economically disadvantaged might fail in academic life and drop out school (Weaver, 2009). Consequently, early investments and interventions in children's experience can be helpful to avoid negative outcomes of low-SES on academic achievement later in life (Bumgarner & Brooks-Gunn, 2013).

Heterogenic student audience in terms of socio-economic status is one of primary problems of the systems of education and teachers (Ball & Marroy, 2009). It is possible that teachers who teach students coming from disadvantaged socio-economic background have more difficulty than the teachers who teach students with more wealthy lives (Rist, 1970). Hence, it is obvious that disadvantaged students in developing countries have to face more difficulties than the students in developed countries (Buchmann & Hannum, (2001). Accordingly, at least at school, all disadvantaged students should receive the same educational equipment with the students who come from the high-SES status family (Simon, Malgorzata, & Beatriz, 2007; MoNE, 2016b).

The family's wealth has an effect on the students' performance in schools but socio-economic status significantly varies across the countries (Gilligan, 2000). Some relatively developed countries have big budgets to spend on education (Wolf, 2002). For this reason, investments of academic performance of students within countries should be evaluated and measured regarding income per capita because developing countries have very low GDP (Gross Domestic Product). Turkey is one of the countries which have low income per capita among the OECD countries (MoNE, 2016c).

The role of family on students' achievement

Newman and Blackburn (2002) classify the protective and risk factors in resilience as individual, family, and environment. Protective factors in a resilient child can be listed as relationships within peers, family, and community including close relationship with adults and peers, effective schools, public safety, health care

availability, and extracurricular activities (Weaver, 2009). On the other hand, risk factors are lack of communication, genetic factors, family problems, poverty, and households (Masten & Reed, 2002).

One of the important factors on children' academic achievement is parental cultural capital, such as reading behavior and participation in art activity (De Graaf et al., 2000). However, continuity of these aspects requires certain income and educational background, but low-SES students do not have these attributes. A transgenerational Model of Poverty is given below (see Figure 2):

DISADVANTAGED CHILDREN

POVERTY

Poor maternal health
Poor maternal growth
Poor maternal nutrition
Inadequate family planning
Poor obstetrical supervision

Elevated infant mortality
Elevated infant morbidity
Elevated family size

Malnutrition
Illness
Absence of medical care

Social deprivation
Environmental
inadequacy

INCREASED RISK OF SCHOOL FAILURE
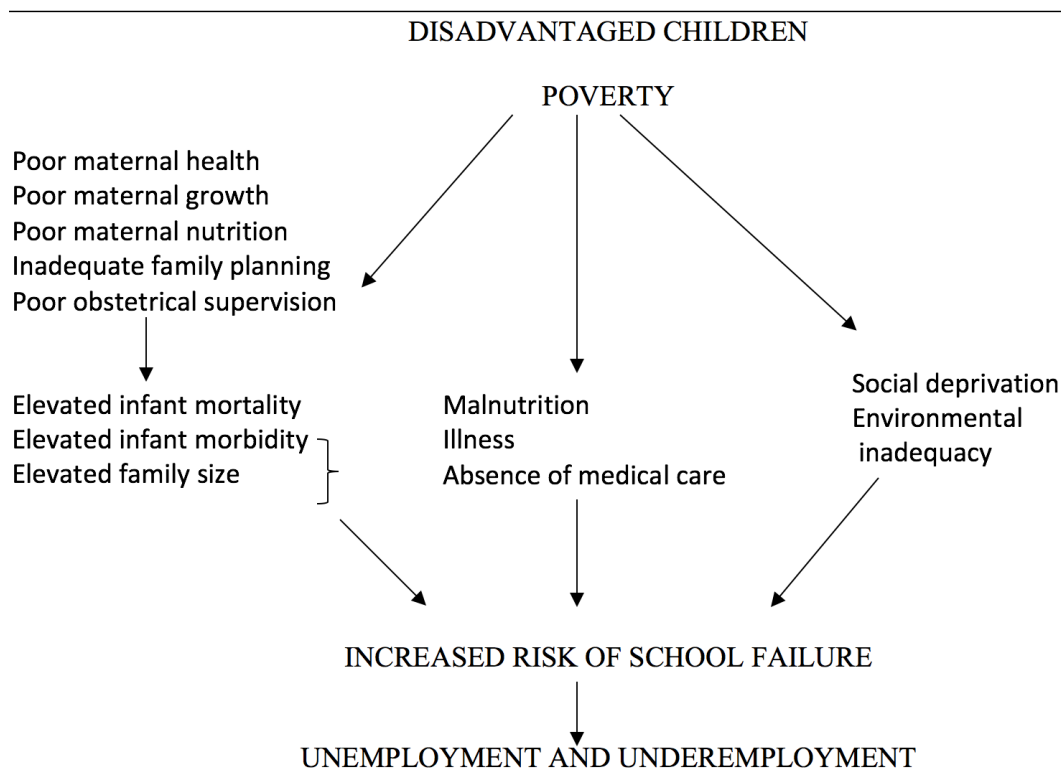
UNEMPLOYMENT AND UNDEREMPLOYMENT

Figure 2. A transgenerational model of poverty: Its consequences and correlates

Source: Birch, H. G., Gussow, J. D. (1970). Disadvantaged children: Health, nutrition, and school failure.

Many academic studies proved that socioeconomic status, social network, and competence have a considerable impact on child development and well-being in later

life (Pinquart & Sörensen, 2000; Bornstein & Bradley, 2014). Moreover, parental network provides an opportunity to use economic resources of school and local authority for educational attainment, but every student does not have equal chance to use same economic resources because of ethnic differences. It was found that Kurdish and Romani families have more difficulty to access economic resources of school and local government (Çelik, 2016). Consequently, dropouts are mainly among Kurdish and Romani families. Lareau and Horvat (1999) find that middle-class families tend to work collectively with school and public resources in contrast to working-class and poor parents. This study shows that middle-class families create more opportunities on academic achievement for their children. In contrast to the study of Çelik (2016), they do not consider race as a factor which discriminates against the families coming from different ethnic background.

The role of schools on students' achievement

Students find support outside of home, particularly in schools. Resilient students like school, and school is more than numeracy and literacy for them (McMillan & Reed, 1994). Physical conditions of schools and classroom atmosphere may have an effect on the students' engagement (Bandura, 2003). For example, the students in small schools feel more comfortable and they become more participative in lessons (Finn & Voelkl, 1993). Classroom settings affect motivation and academic achievement (Harter, 1996). Attachment of low-SES students to the school is important because school protects the young adults from risk factors and motivates them for academic success (Ungar & Liebenberg, 2013). Since school is the only way to increase low SES students' level of education, academic resilient students will have a high level of school attachment (Gilligan, 2000).

Equity in education is a key element which is defined as providing highly qualified opportunity to all students so that they can benefit from education regardless of family background, gender, and socio-economic and cultural status (Klein, 1985; OECD, 2016b). The way they define equity does not indicate that everyone has to achieve same goals, nor can they be exposed to same type of teaching methods in learning (Klein, 1985). Equity is providing conditions to reduce negative effects of adversities which originally immigrant students and low-SES students have to face in education (Maddox & Prinz, 2003).

Pre-adolescent children who are in the stage of biological, psychological and identity changes can develop their internal resilience capacity (Çelik, Çetin & Tutkun, 2015). The students who take pre-school education less than one year perform worse than who do not (Verdine et al., 2014). However, this result does not comply with the situation in Turkey because students who study pre-school for up to two years performed much better than the students who do not get any pre-school education. TIMMS 2015 National Report indicates that the difference between students who receive pre-school education and those who do not receive pre-school education is 17 points (MoNE, 2016d). TIMSS is the Trends in International Mathematics and Science Study is a series of international assessment of students' mathematics and science knowledge around the world and organized by International Association for the Evaluation of Educational (IEA). IEA aims to compare students' educational achievement (IEA, 2017). Pre-school experience positively affects students' academic achievement, readiness to school, and creativity (Knox & Glover, 1978).

Resilience is a combination of individual's aspects such as intelligence, coping styles, sense of self-worth and belonging, strong peer relationship, and supportive adult relationship (Ungar & Liebenberg, 2013). For instance, teachers may play an importance role in encouraging students to develop social and emotional skills in order to overcome difficulties (Howard & Johnson, 2000).

Furthermore, formal school environment can be a protective factor or the opposite, so teachers and administrators play a great role for students to have positive perception about school environment (Jindal-Snape & Miller, 2008). Besides awareness, school programs should be developed aligning with the qualifications that give children an opportunity to thrive self-esteem. Extracurricular activities, like sports, are also helpful initiatives (Dodge & Lambert, 2009). On the other hand, excessive sports activities do not enhance students' academic achievement when compared to optimal sports activities (White, 1982). For resilient students, extracurricular activities are informal sources of support (Şirin, 2005). They not only enhance students' self-esteem and involvement, but also yield a network of peers who have common values (Coburn & Nelson, 1989; McMillan & Reed, 1994). Many of resilient students have a feeling that they have to be a part of extracurricular activities in order to be accepted by the majority of students because this involvement fosters resilient students' positive engagement in schools. Resilient students use their time effectively and they are more involved in school and outside of school activities (Geary, 1988). The activities like sports have a positive effect on disadvantaged students to be resilient, yet extreme extracurricular activities do not increase the levels of achievement (White, 1982). Additionally, extracurricular activities have an important role in students' engagement with their environment and

peers. However, extended extracurricular activities are not directly related to academic achievement among disadvantaged students (Finn & Rock, 1997).

The role of homework in enhancing students' achievement is still partly understood because the results of international student assessment on academic achievement show a diverse result across the countries. Participant students in countries that perform well in PISA spend less time in individual and out of school study than students in countries that perform poorly in PISA (OECD, 2016a). The countries among the OECD participants, in which students perform well and spend less time for homework after school, are Germany, Finland, Japan, and Switzerland. In these countries, students spend time on studying between 10 and 15 hours a week. In Turkey, however, students spend around 24.5 hours a week for studying (MoNE, 2016c). These results show that amount of time spent after school does not give significant information about students' high performance. Rather, it gives an idea about the quality of education system in schools. Homework also plays an important role in academic achievement. For example, the TIMSS study reveals that more than half of Japanese students from high and middle ability levels take additional mathematics courses out of school and they have an opportunity to do exercises that are relevant to their homework (Trautwein & Köller, 2003). Although Japanese students spend less out of school study hours than Turkish students, they perform better in the PISA 2012 and TIMMS 2015 (IEA, 2017; OECD, 2013b). Thus, activities in schools are more effective than out of school activities on students' academic achievement. Besides, students who want to pursue Master's or PhD degrees perform better than other participant students in all categories (MoNE, 2016d).

Zimmerman and Kitsantas (2005) investigated positive relationship between homework practices and students' academic achievement. In the study, homework practices are found as predictive for the students' self-efficacy belief with respect to their perceptions of having capability and responsibility for learning. Bandura (1997) states that self-efficacy belief enhances academic achievement of students. In the meta-analysis of academic benefits of homework, homework completion is associated with increased understanding and retention of academic material. They find little correlation between homework and test scores. However, it is found that there is a strong and positive relationship between homework and academic achievement in secondary school (Zimmerman & Kitsantas, 2005). However, young children seem to have limited capacity to focus their assignments for a long time and they may not have proper study skills yet (Cooper & Valentine, 2001).

The role of teacher on students' achievement

Masten and Reed (2002) support that resiliency possesses different types of effect when it is combined with internal locus of control. In their argument, phenomenon of resilience is children who succeed in spite of serious challenges to their development (Taylı, 2008). In addition, resilient children intend positive adaptation in a circumstance which causes a notable adversity or risk (Zolkoski & Bullock, 2012).

Resilience of an individual has mainly been investigated regarding risk and protective factors surrounding the child (Çelik et al., 2015). Thus, children need an adult in a safe place to support their academic and social skills such as articulation (Horton & Wallander, 2001). Teachers have a big role to encourage students to gain intrinsic and extrinsic motivation for classroom learning, self-esteem, and a level of

voice to express themselves in adolescents (Harter, 1996). The significant difference between resilience and non-resilient students is engagement with the school such as being punctual and participative, being prepared for school subjects, and circumventing misbehaviors in class (Finn & Rock, 1997).

In addition to needing a teacher that can help develop academic achievement, resilient students need a teacher who has interpersonal skills and professional skills. The students at risk refer to features of a good teacher as being respectful and able to get along with them (OECD, 2013b). From academic perspective, students want qualified teachers who present current and future goals of the education system and school, along with teachers who are enthusiastic to listen and encourage students for their personal as well as academic development (McMillan & Reed, 1994). The findings tell that teachers who have standard teaching certificates have a statistically significant effect on the students' scores in tests (Goldhaber & Brewer, 2000).

In social cognitive theory, self-efficacy is the belief of an individual in his or her ability to succeed in a specific task (Bandura, 1997). Self-efficacy mechanism plays a central role to produce academic achievement (Bandura, 1991). Teachers and parents have vital role in building a sense of efficacy by monitoring students' progress of learning (Caprara et al., 2011). As a result, it is possible to deduce that self-efficacy seems to be an internal factor of an individual, but it is also built by the adults around the child. Motivational skills require motivation based on interest, self-efficacy, and attributions in problem solving (Mayer, 1998). Moreover, teachers' self-efficacy beliefs increase students' thinking skills, efficacy, and academic

achievement because teachers with high efficacy have an orientation toward teaching (Anderson, Green, & Loewen, 1988).

A school teacher can strengthen equity in after-school class while a teacher who is not from the school can sharpen inequities among students (Hanewald, 2011). When students think that doing well in science is essential, the time consumed in science classes have a considerable impact on student performance in science (OECD, 2013c). Teachers might use the advantage of resilience potential in children to develop their academic and social skills (Klein, 1985). School environment, teachers' qualification and attitudes towards students, and family support in children's cognitive and social development are considered to be resilient for individuals coming from low-SES (McLaughlin & Talbert, 2006). Teachers can collaborate with parents to foster healthy development of children (Hill & Taylor, 2004).

Besides professional qualification of teacher, as well as verbal and non-verbal immediacy of the teacher have positive impact on the students' academic achievement (Howard & Johnson, 2000). A meta-analytical review of the relationship between teacher immediacy and student learning shows that there is meaningful correlation between teachers' verbal and non-verbal immediacy and student reports of perceived learning and effective learning. The results of the study confirm that teacher immediacy has a significant role on the students' attitudes and perceptions in relation to their learning, but it does not have a strong relationship with cognitive learning performance (Witt, Wheeless, & Allen, 2004).

Teachers' verbal and non-verbal immediacy with respect to student reports has positive and linear relationship with perceived cognitive, effective, and behavioral learning (Christensen & Menzel, 1998). The teachers who are perceived as more communicator by students are also perceived as more effective. Thus, students gain a positive perception about teaching effectiveness and student learning regarding teachers' constructive communication behavior such as being relax, open, and friendly (Andersen, Norton, Nussbaum, 1981).

Resilience

The concept of resilience was redefined in accordance with the concerns of the governments and international agencies to help the children who have to face threats in their lives (Ungar & Liebenberg, 2013; Masten, 2014). The resilience of a person always changes by time and experience (Seligman, 2007). Moreover, capability of an individual for adaptation and recovery may be distributed across attachment relationships, reward systems, intelligence functions, and culture (Rutter, 2012). Recovery from failure and being bullied at school were also defined as resiliency (Catterall, 1998).

The famous Coleman (1966) study results showed that black students from low-SES background and white students coming from more comfortable life had similar academic achievement at the beginning of their academic lives in elementary school. After years, same students had significantly different academic achievement because white students were highly advantageous in accessing book sources, equipped laboratories, and well-paid teachers which mean economically well-motivated teachers (Pinquart & Sörensen, 2000). Although Coleman did not use the term

resilience, he stated the importance of equity in education with giving an example of comparison between black and white students' performance throughout their elementary, middle, and high school (Simon et al., 2007).

Risk factors associated with resilience

There are some risk factors that are attributed to resiliency (Rouse, 2001). One of these factors is the children's social environment (Newman & Blackburn, 2002). That is, the neighborhood has an influential adversity and negative impact on the adolescents (McMillan & Reed, 1994). Nevertheless, voluntary organizations, social clubs, and businesses help students to cope with disadvantaged neighborhoods (Lee & Madyun, 2009).

Another factor is considered to be antisocial behavior (Masten & Coatsworth, 1998). In childhood, antisocial behaviors drag students to fail in school lessons (Masten, 1994). In fact, these conducts may cause later problems such as lack of well-being (Pinquart & Sörensen, 2000). On the other hand, children who leave their conduct problems in the early school years do not relocate the negative effects in the young adulthood years (Sylva et al., 2010). For example, Cambodian children suffered trauma during and after the war, but many of them became very productive adults in the United States after leaving their problems behind (Masten et al., 2003).

Protective factors associated with resilience

Resilience is also associated with some protective factors (Vallon, 2010). Family, one of the utmost protective factors, has an essential role in promoting resilient behaviors among children and adolescents who have several odds in their lives

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(Lareau & Horvat, 1999). Teachers emphasize the importance of involvement of the family in the development of resilient behaviors (Howard & Johnson, 2000). The promotive factors are cognitive abilities, temperament, parenting quality, and good schools (Rutter, 2012). The family may encourage their children with supportive relationships in order to gain independence and maturity to handle difficult situations which the children have to experience in the community and home (Maddox & Prinz; Chiu, 2007).

According to the model developed by Kumpfer (1999), resilience is defined as having six main components which are adversity, resiliency process, internal protective factors, external protective factors, positive results, and positive factors which are enhanced as a result of interaction between person and environment. The resilience framework is shown in the Figure 3.
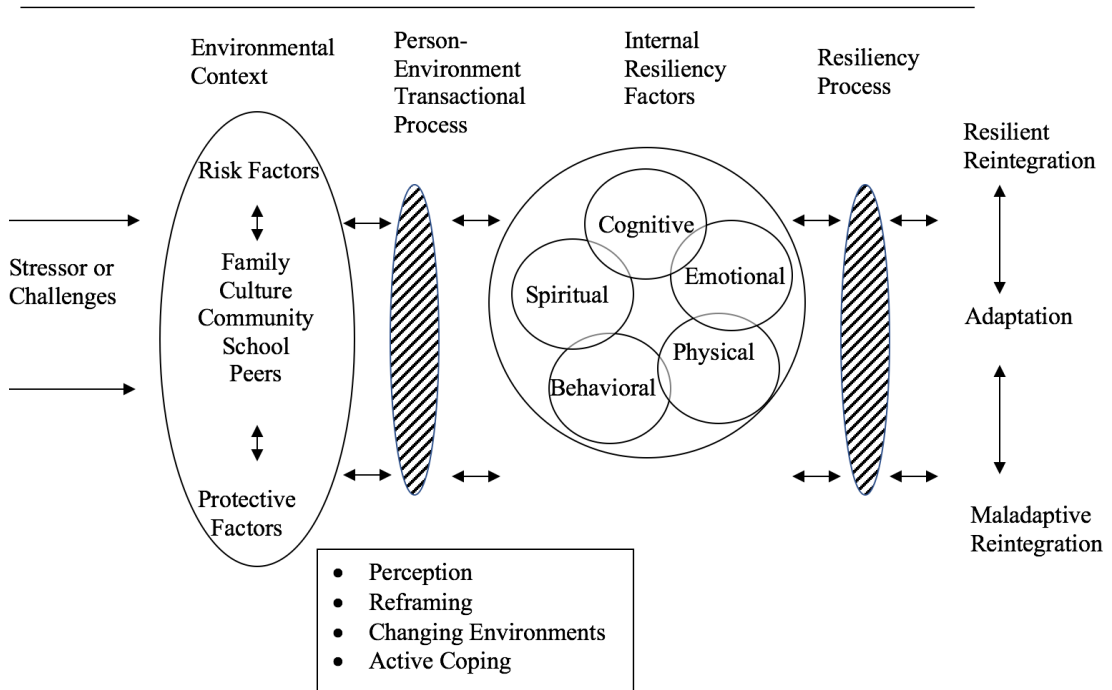
Figure 3.The resilience framework of Kumpfer (1999)

Hope, as an internal factor and social support as an external factor in resilience, has a contribution to risk factors caused by family (Horton & Wallander, 2001). High self-esteem is a characteristic of individuals who overcomes adverse or risky situations (Mruk, 1999). The theory of self-esteem states that self-esteem is the way people see themselves worthwhile and accepted by others (Jindal-Snape & Miller, 2008). Original formula of self-esteem appears to be well regarding success and feeling good about themselves (Seligman, 2007).

Academic resilience

In literature, low-SES students who complete school with high academic performance are called as resilient (Wolf, 2002; Yılmaz-Fındık & Kavak, 2013), students who complete the school with low academic performance are called non-resilient students (Hanewald, 2011), and non-completers are the students who drop out of school (Finn & Rock, 1997). Academic resilient students are actively engaged in schools and their engagement is based on two components (Horton & Wallander, 2001). First, school environment and engagement in lessons have a big role for achievement (Bandura, 2003). Second, some characteristics, like socio-economic status, cannot be manipulated for the academic achievement of students (Bumgarner & Brooks-Gunn, 2013). With these premises, educators may have a big role to encourage students to complete their schools and achieve higher scores in lessons because student's active participation in the school is strongly related to motivation (Coburn & Nelson, 1989; Finn & Voelkl, 1993; Christensen & Menzel, 1998).

Academic achievement and behaviors of the adolescents are positively correlated because academic failure may cause negative behaviors that get the students out of

the safe environment having the groups who do not abide the rules of society (Masten & Coatsworth, 1998). Moreover, students who take the place in a society have high IQ level or qualified parents and these children have high intellectual functioning but antisocial children and criminal adults do not (Masten & Coatsworth, 1998).

The PISA results offers important insight into the relationship between students' socio-economic status and their academic achievement in the participating countries and regions (OECD, 2010). Unfortunately, the PISA exam measures only literacy, science, and math capabilities of the students. It is not possible to measure different skills of the student such as rhetoric, music, or art through this survey.

Non-resilience is the tendency of students who emphasize the doubts that they would finish high school (Catterall, 1998). Academic resiliency can be also defined as the tendency of the students who perform at a low level and then significantly improved their levels at higher grades (Gilligan, 2000; Davidson, 2010).

Risk factors associated with academic resilience

Academic resilience can be associated with some risk factors. Single parent (Hill & Taylor, 2014), broken family (Maddox & Prinz, 2003), low income or salary (Hall et al., 1985), peer abusing (Cosden, 2001), and environment at risk are some examples as the risk factors related to academic resilience (Zolkoski & Bullock, 2012). Risk factors differ from one another in terms of levels (Baker, 1999). High-risk factors are defined as low-SES, lower parental education, homelessness, and single-parenting and low-risk factors are better SES and parenting (Masten et al., 2003).

The main concern of the government for education must be the equity of education for each individual because academically low-nurtured citizens will not show qualified performance in their social and work life (Klein, 1985). This vicious circle will continue from generation to generation if the government does not manage this inequity in education because one of the most important factors of having academic success is the level of family education (Lareau & Horvat, 1999). Whereas, the family factor can be a risk factor when the parents are divorced (Lee & Madyun, 2009), one or two parents die (Marshall, 1995), or when they have mental illness that may prevent them from taking care their child (Rutter, 2012).

Protective factors associated with academic resilience

There are three primary factors that have a significant effect on the resilient behaviors of children and adolescents: family, school, and community (Masten, 1994; Martin, 2002; Martin & Marsh, 2006). Personal and academic support of teachers and parents for children at risk are also important for academic achievement (Finn & Rock, 1997; Newman & Blackburn, 2002; Masten, 2014). Internal and external factors make a student "advantaged" or "disadvantaged" such as the external ones related to family, environment, and school atmosphere and the internal ones related to the student's self-confidence and self-motivation (Rouse, 2001; Ball & Maroy, 2009).

External factors (Horton & Wallander, 2001) are stated as family (e.g., single parent, divorce, poverty), neighborhood which influences an impact on the adolescents, and school environment including teachers' attitudes and interest towards students (Arastaman & Balcı, 2013; Arat, 2014). Family factors are income, single parent or

broken family, poverty, and physical conditions of the housing such as a having personal desk, library, or private room (White, 1982; Şirin, 2005). Environmental factors are neighborhood, neonatal stress, poverty, abuse, alcoholism, and criminal activities (Wang & Holcombe, 2010). School factors are peer relationship, attitudes of teachers towards students, access to library and laboratory (Coleman, 1966; Kumpfer, 1999; Howard & Johnson, 2000; Masten, 1994). One of the most important protecting factors of an individual is attachment to school which helps students to improve positive outcomes and avoid negative outcomes (Maddox & Prinz, 2003).

Neighborhood mechanism has a close relation to educational outcomes as school performance (Milam et al., 2010). High residential mobility is an essential factor to neighborhood relationship because an individual has less opportunity to have long-standing social relationship (Şirin, 2005). Such relationships are important for nurturing young people's health and social development (Birch & Gussow, 1970). For example, black students in disadvantaged neighborhood have tendency to cope with the adversities such as stressful events and low socio-economic resources because disadvantaged students have potential inner positive mechanism which, is connected to academic achievement with the perspective of social mobilization (Lee & Madyun, 2009).

Internal factors are the characteristics of an individual such as their locus of control (Gizir, 2009), self-respect (Marshall, 1995), self-efficacy (Schunk, 1991), autonomy (Benard, 1995), and problem-solving skills (Mayer, 1998; OECD, 2013c).

Disadvantaged students, despite the barriers, are able to develop their individual coping skills for higher academic achievement (Yavuz & Kutlu, 2016). These academic resilient students are able to overcome economic and social odds in their lives and reach a higher level above the national average in their country (Kalender, 2015; OECD, 2013b).

One of the protective factors is self-efficacy (Zimmerman & Kitsantas, 2005). Self-efficacy is task-specific self-confidence that describes a personal belief in an individual's capacity to accomplish courses of action at designated levels (Bandura, 1984).

According to the social cognitive theory of Bandura, self-efficacy beliefs provide the foundation for motivation, well-being, and personal accomplishment to foster outcomes that one expects (Bandura, 1997; Caprara et al., 2011). Student confidence in his or her social skills can construct successful social interactions (Davidson, 2010). Similarly, student confidence in academic skills anticipates high marks on exams, assignments, and oral marks (De Volder & Lens, 1982). Therefore, lack of self-efficacy in a person in social skills conceives of rejection before trying to establish social contact (Pajares & Urdan, 2006). Students with low self-confidence in academic skills do not have hope to receive high marks in school lessons (Pajares & Urdan, 2006).

Another protective factor is autonomy (Fazey & Fazey, 2001. Student autonomy or learner autonomy is the ability to organize students' own learning (Grolnick & Ryan, 1987), to design their own self-evaluation (Murtaugh & Zetlin, 1990), and to have

their own point of view about school subjects and projects (Yang, 1998). Autonomy is described in accordance with three aspects in education: (1) a way of education that teachers assist students in reaching their academic goals (Baker, 1999), (2) an approach to educational practice for conducting courses that students are independent and responsible when they make decision (Cooper & Valentine, 2001), and (3) a part of any kind of learning that students can be more effective for making decision in an area which is not very limited (Boud, 2012).

The last protective factor in this study is perseverance (Duckworth et al., 2007). Perseverance of students plays an essential role as much as self-efficacy and autonomy (Boud, 2012). For instance, students who have high academic achievement and high study persistence attached meaningfully higher valence to goals in the distant future (Brackenreed, 2010). Besides, these students perceived studying hard as more instrumental for reaching goals in the distant future and open present, than students who have low academic achievement and low study persistence (De Volder & Lens, 1982). The students with high perseverance do not easily give up when confronted with difficulties because they have future plan which is their primary motivational space (Nuttin, 1964). This motivation enhances students to be more persistent in their daily studies and obtain better academic results (Dennis, Phinney, & Chuateco, 2005).

Resilience in Turkey

Turkey has a young population and the rate of resilient students significantly increased between 2003 and 2007 as indicated by the PISA results (MoNE, 2013). According to PISA 2012 results, students from low-SES increase their scores with

respect to students from high-SES in Turkey. The rate of girl resilient students continued to increase from 8% to 12% within years from 2003 to 2012. As can be seen in the OECD average, Turkish students are more successful in reaching top quarter in mathematics literacy as compared to science and reading literacy (OECD, 2013c). The rate of Turkish students reaching the top quarter in the PISA exam has increased since 2006. About 6% of Turkish students reached the top quarter in mathematics literacy and it was assumed that fifty-six thousands of 15-year-old students achieved top quarter in PISA 2012 exam. According to the OECD average, the countries which have larger populations with young students do not only have a substantial number of students in the top quarter but also in the bottom. The OECD defined six levels of achievement for each category in the PISA; the results considered the number of students who could not reach the second level of achievement. The number of students who could not reach the second level of achievement significantly decreased in each category in years (OECD, 2016b; MoNE, 2013). Most of the Turkish students feel happy in school; on the other hand, the rate of absenteeism is significantly higher than the OECD average. In PISA 2012, 8% of Turkish students achieved top quarter from at least one of the three areas assessed (mathematics, science, or reading) but this rate is 16% in the OECD average.

Turkey has a big ratio of students from disadvantaged backgrounds who are able to perform well on the PISA survey. Forty-percent of disadvantaged Turkish students scored in the top quartile on PISA 2012. The rate of resilient students in Turkey is much higher than the average of the OECD, especially the rate of girl resilient students increased from 2% to 8% between the years 2003 and 2007 (MoNE, 2013).

Ministry of National Education states that low-SES girl students are relatively given more chance to overcome the barriers because schools environment such as resources, physical conditions, and a number of student per teacher are highly improved in the years between 2003 and 2012 (MoNE, 2013). These outcomes show that at-risk students use the opportunity of having good school environment to reach their academic goals.

Since the school provides a positive atmosphere for low-SES students to achieve academic success, school attachment can be an important protective factor for students to be academic resilient (Yavuz & Kutlu, 2016). One of the most important factors is socio-economic status in academic achievement (Chung, 2014) However, low socio-economic status does have to be negatively permanent factor to drag the students into failure in education (Brackenreed, 2010). The constructive support of the teacher can help students increase their academic achievement (Klem & Connell, 2004; Kalender, 2015). The relationship between students and teacher, sense of belonging (Ma, 2003), and attitudes toward school and learning (Brodie, 1964) at school were identified as very important factors which affect the academic achievement of the students (Aydiner & Kalender, 2015; Demir & Kalender, 2014). Thus, learning opportunities in the school environment with the support of teachers and administrators may provide higher academic achievement for resilient students (Wang & Holcombe, 2010).

In order to determine students' resiliency, demographic variables such as gender, grade level, grade point average, and absenteeism are found to be the most important predictors (Eamon, 2005). Students, that have successful interactions with the

environment despite the odds such as bullying, violence, high dropout rates, absenteeism, and lack of parental support are defined as resilience (Zimmerman, 1989). The researchers pointed that student-teacher relations have also an important effect on the resilient students (Baker, 1999). They identified the significant relationship between academic achievement and quality of communication between teacher and student to be resilience (Arastaman & Balcı, 2013). The dynamics which affect the student resiliency should be appraised by the school administrator with the family (DePlanty, Coulter-Kern, & Duchane, 2007). Resilience occurs under some domain conditions as some threats against one's well-being and health such as lack of parent support and environmental odds (Spence, Helmreich, & Pred, 1987; Arat, 2014).

Additionally, sensual factors effecting students' skill are also important. The attitude and tendency of students towards science may have a sensual level of students' interests, maintain their attendance, and motive to activate (Schibeci, 1984; Osborne, Simon & Collins, 2003; OECD, 2016a). When sensual features of students towards science are analyzed, level of interest and motivation in Turkish students is highly above the OECD average. Students in Turkey enjoy science lessons and they find themselves highly sufficient for understanding scientific concepts as compared with the OECD average (MoNE, 2016c). The number of Turkish students who want a career related to science is also above the OECD average. Students in Turkey have a positive attitude towards science lesson and jobs related to science even though they academically scored below the OECD average (MoNE, 2016c).

Academic performance (Cassady & Johnson, 2002), educational aspiration (Allen, 1992), self-esteem (Ross & Broh, 2000; Alves-Martins et al., 2002), loneliness (Nipcon et al., 2006), self-efficacy (Bandura, 1984), emotional expression (Lumley, & Provenzano, 2003), disability (Vogel, 1990), teacher-student relation (Baker, 1999), parental involvement (Fan & Chen, 2001), peer support (Dennis et al., 2005) were defined as protective and risk factors. According to study, resilience is a socio-cultural concept (Davidson, 2010), because protective factors, risk factors, and coping skills are not same different all over the world (Arastaman & Balcı, 2013). The researchers stated that resilience should also be reviewed deeply with a psychological perspective (Rutter, 1987; Martin & Marsh, 2006).

CHAPTER 3: METHOD

Introduction

In this chapter, the methodology of this study was presented. First, research design and context were defined. Then, sample and sampling procedure were described. After that, details of instruments, data collection and analyses procedures were given.

Research design

In the current study, correlational approach was used to find the relationship between academic achievement and the factors chosen from PISA 2012 survey (OECD, 2013a). In general, correlational study is a quantitative method of research in which the correlation is determined between or among two or more quantitative variables from the same group of individuals (Fraenkel, Wallen, & Hyun, 1993; Anderson, 1998). In correlational study, variables cannot be manipulated and relationship between some set of variables attitudes towards school: learning outcomes, attitudes towards school: learning activities, sense of belonging to school, openness for problem solving, out of school study time, perseverance, and teacher student relations and academic achievement are investigated.

Context

Turkish students who participated in PISA 2012 represent a socio-economically diverse group which can be evidenced by the Economic, Social and Cultural Status (ESCS) developed by the OECD.

This index was defined by using several variables such as highest level of education of the student's parents, family wealth, home educational resources, and possessions related to "classical" culture in the family home (Chiu, 2007; OECD, 2013a). Many different school types and geographical regions of Turkey involve students with different ESCS levels. The research was conducted in 13 different types of schools in Turkey. These schools are categorized as general secondary school and vocational and technical secondary school (MoNE, 2013).

Turkish pupils mostly study at General High School, Anatolian High School, Vocational High School, Anatolian Vocational High School, Technical High School, Anatolian Technical High School, Multi Programme High School, Imam Hatip High School, and Anatolian Imam Hatip High School. General High Schools accept the students after 8 years of elementary school without any entrance exam and students gain general knowledge and citizenship consciousness from these schools. Anatolian High Schools require entrance exam after 8 years of elementary school and these schools are 5-year-long with one year of English education. Vocational and Technical High Schools offer technical courses and students take such education that provides a profession without having a university degree. The student in this school types are offered to enroll some higher education programs without taking university admission examinations in Turkey (MoNE, 2016c).

Geographical regions also represent diversity. Educational opportunities, family background and many other variables related to student achievement shows large variation across geographical regions.

Sampling

In PISA 2012, a two-stage stratified sample design was used as sampling design. The first sampling units included individual schools that have 15-year old students. The schools were selected systematically from the list of all the PISA-eligible schools which are known as school sampling frame. This systematic sampling refers to Probability Proportional to Size sampling. Before sampling, schools are assigned to exclusive groups based on school type called explicit strata to increase the precision of sample-based estimates. The second sampling units including two-stage design was used to select students in the schools. In each participant country, a Target Cluster Size was set and the number of students in the set was 35 selected with equal probability but this value might change according to the agreement with the participant countries. These scientific sampling methods were used to select a group of students representing the full of target population of 15-year-old students in the participant countries (OECD, 2014a).

The schools were stratified in the sampling frame. The schools were classified into similar schools with respect to selected variables that were stratified variables. Stratification in PISA 2012 was used to increase efficiency of the sample design and to make survey estimates more reliable. Different sample designs were applied to specific groups of school in particular regions. Two different types of stratifications as implicit and explicit stratifications were applied. Stratification variables used in Turkey for PISA 2012 were as follows: (1) explicit stratification variables were 12 statistical regions and 4 types of school program, (2) the number of explicit strata was 38, and (3) implicit stratification variables were types of schools, genders, urbanicity, and funding types (OECD, 2014a).

15-year-old students were sampled using the stratified systematic sample with sampling probabilities. The number of total 15-year-old Turkish students is 1.266.638. The number of 15-year-old students that reach 7th grade and higher and these students were randomly selected for PISA 2012 assessment. 65% of students were in 10th grade, 28% of students were in 9th grade and 4% of students were in 8th grade in Turkey (MoNE, 2013). PISA 2012 in Turkey collected the data from 12 statistical regions called Nomenclature of Territorial Units for Statistics (NUTS) (OECD, 2014a). According to this classification, region strata in PISA 2012 are: Istanbul, Eastern Marmara, Western Marmara, Central Anatolia, Northeastern Anatolian, Southeastern Anatolian, Middle East Anatolia, Western Anatolia, Aegean, Mediterranean, Eastern Black Sea, and Western Black Sea.

The number of students selected for PISA 2012 with respect to geographical region was 573 in Aegean, 453 in Black Sea, 1415 in Marmara, 616 in Mediterranean, 755 in Central Anatolian, 383 in Eastern Anatolian, and 438 in Southeastern Anatolian. The most of students were selected from Marmara Region because it is most crowded region and Anatolian Region is the least crowded region in Turkey.

Numbers of students in each school type are as follows: Primary School, General High School, Anatolian High School, Science High School, Social Sciences High School, Anatolian Teacher Training High School, Vocational High School, Anatolian Vocational High School, Technical High School, Anatolian Technical High School, Multi Programme High School, Police High School[1], fine arts, and

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[1] Police High Schools were shut down in 2016

sports, vocational and technical secondary schools are Imam Hatip High School[2],

and Anatolian Imam Hatip High School[3].

Therefore, the number of students who participated to PISA 2012 is 4848 from 12

statistical regions and 13 school types in Turkey (MoNE, 2013). For the present

study, all students from low-SES in Turkey were included. The average score among

participant countries was 500 points with 100 points of the standard deviation

(OECD, 2012b). Around two-thirds of participant students scored between 400 and

600 points in PISA. Disadvantaged students who scored above the international

mean are called resilient in PISA. However, in PISA 2012, the mean score of the

OECD was 494 and the mean score of Turkey was 448 in mathematics literacy. In

science literacy, the mean score of the OECD was 501 and mean score of Turkey

was 463 (OECD, 2014b). Since there is a significant mean difference between the

OECD and Turkey, the resilient students were determined according to mean score

in each category of Turkey (MoNE, 2013).

For this study, an additional sampling was made to define resilient students using

ESCS index of PISA 2012. Turkish students at the bottom quarter in ESCS (-2.28 or

below) were labeled as socio-economically disadvantaged or low-SES students. In

Turkey, number of socio-economically disadvantaged students who participated in

PISA 2012 was 1200 out of 4848.

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[2] Imam Hatip High Schools offer religious education in addition to courses national
curricula
[3] Anatolian Imam Hatip High Schools offer religious education in addition to courses
national curricula

Having selected low-SES students, these students were categorized into three groups as low achievers, average, and resilient, all low-SES. Low-SES students who scored above average of Turkey in mathematics (M=370.96) and science (M=400.57) was called resilient student (n=408). Disadvantaged students who scored below the average of Turkey in mathematics was called low-SES and low achievers (n=392 in science and n=393 in mathematics). Disadvantaged student who scored the average of Turkey in mathematics and science were called average student (n= 396 in science and n=395 in mathematics).

Instrumentation

The PISA survey assesses 15-year-old students' academic achievement in reading, mathematics, and science. PISA 2012 mainly focused on mathematic skills but PISA does not assess how well students know the curriculum topics, it rather investigates how well students are able to apply their academic knowledge in real life events. The PISA assessment includes two parts: the first part includes the tests under three domains to assess students' science, mathematics, and reading literacy. The second part of the PISA includes a student questionnaire that gives information about the view of the student toward school and teachers, personal information, and family (OECD, 2016b) using different types of items such as multiple-choice questions, complex multiple-choice questions, open-ended questions, and close-ended question.

These items are aimed to assess how well students can apply their academic knowledge into real-life challenges. The PISA assessment is a pencil-and-paper test and all the test questions are multiple-choice. Students are required to construct their

own answers. Test material includes texts, pictures, graphs or tables related to real-life situations (OECD, 2016b).

The PISA defines proficiency levels using the score boundaries for each domain. Students are categorized as top performer, strong performer, moderate performer, and lowest performer. In mathematics domain, there are 7 levels. Lowest performers are the students at or below Level 1 of assessment. A student at the lowest level can answer the questions including familiar context where relevant information is present and the questions are clearly defined. The student is able to identify information and carry out the routine procedure regarding direct instruction in explicit situation. The student can perform an action which is almost obvious and follow immediately from the given stimuli. The highest performers are the students at Level 5 or Level 6 of assessment. The highest proficiency level at Level 5 is for students who can work and develop with models of complex situations, identifying constrains and specifying assumptions. Top performers at Level 6 are the students who can conceptualize, generalize, and utilize information based on their investigation and modeling of complex problem situation. Those students can link different information sources and translate among them. Students at Level 6 are capable of advanced mathematic thinking and reasoning (OECD, 2013c).

Similarly, seven proficiency levels are defined in the science domain. If a student is at the lowest level, he or she can present scientific explanations which are obvious and follow from given evidence. The student at Level 1 has limited scientific knowledge that it can be applied to a few, similar situation. On the other hand, Level 5 includes students who can identify scientific components of many complex life

situations and apply both scientific concepts and knowledge into life situation. Those students can construct explanation and arguments based on evidence and their critical analysis. They have such skills to link different information knowledge and bring critical insights to the situations. The students at Level 6 are those who can identify, explain, and apply scientific knowledge and knowledge related to science in a variety of complex life situations. They are able to link different information sources and use evidence from those sources to justify decisions. They can clearly and consistently show advanced scientific thinking and reasoning using their scientific understanding in unfamiliar scientific and technological situations (OECD, 2013c).

In Turkey, low-achieving and resilient students among disadvantaged ones are at the lowest (Proficiency Level = 1) and highest level (Proficiency Level = 2) in mathematics literacy, respectively, whereas low-achievers and resilient students among disadvantaged ones are at the lowest (Proficiency Level = 1) and highest level (Proficiency Level = 2) in mathematics literacy, respectively. 32% of low-SES students in mathematics and science literacies are above the average of Turkey and 33% of low-SES students are below the average of Turkey. The numbers of resilient students in both domains in Turkey is 408.

For this study, factor scores were used in this study. For each factor, higher scores indicate higher frequency and/or agreement. The factors were selected as follow: *Out of School Study Time* (6 items), *Teacher Student Relations* (5 items), *Sense of Belonging to School* (9 items), *Attitudes towards School: Learning Outcomes*

(4 items), *Attitudes towards School: Learning Activities* (4 items), *Perseverance* (5 items), and *Openness for Problem Solving* (5 items) (OECD, 2012a). Items in each factor are given below in Table 1.

Table 1
Factors and their respective items[4]

Factors	Items
Out-of-School Study Time	Homework [ST57Q01]
	Guided Homework [ST57Q02]
	Personal Tutor [ST57Q03]
	Commercial Company [ST57Q04]
	With Parent [ST57Q05]
	Computer [ST57Q06]
Student-Teacher Relations	Get Along with Teachers [ST86Q01]
	Teachers Are Interested [ST86Q02]
	Teachers Listen to Students [ST86Q03]
	Teachers Help Students [ST86Q04]
	Teachers Treat Students Fair [ST86Q05]
Sense of Belonging to School	Feel Like Outsider [ST87Q01]
	Make Friends Easily [ST87Q02]
	Belong at School [ST87Q03]
	Feel Awkward at School [ST87Q04]
	Liked by Other Students [ST87Q05]
	Feel Lonely at School [ST87Q06]
	Feel Happy at School [ST87Q07]
	Things Are Ideal at School [ST87Q08]
	Satisfied at School [ST87Q09]
Attitude towards School: Learning Outcomes	Does Little to Prepare Me for Life [ST88Q01]
	Waste of Time [ST88Q02]
	Gave Me Confidence [ST88Q03]
	Useful for Job [ST88Q04]

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[4] The item coded in the original PISA 2012 dataset are given in the brackets (OECD,2012a)

Table 1(cont'd)
Factors and their respective items

Attitude towards School: Learning Activities	Helps to Get a Job [ST89Q02]
	Prepare for College [ST89Q03]
	Enjoy Good Grades [ST89Q04]
	Trying Hard is Important [ST89Q05]
Perseverance	Give up easily [ST93Q01]
	Put off difficult problems [ST93Q03]
	Remain interested [ST93Q04]
	Continue to perfection [ST93Q06]
	Exceed expectations [ST93Q07]
Openness for Problem Solving	Can Handle a Lot of Information [ST94Q05]
	Quick to Understand [ST94Q06]
	Seek Explanations [ST94Q09]
	Can Link Facts [ST94Q010]
	Like to Solve Complex Problems [ST94Q014]

Method of data collection

The students between the ages of 15 years and 3 months and ages of 16 years and 2 months who study formal education in Turkey can be participant for the PISA tests and surveys (MoNE, 2016b). The reason that 15-year-olds are the focus because the most of participant countries have young people who are close to finish compulsory education (OECD, 2013c).

All students take a two-hour test, which focuses on mathematics, science, and reading skills. Different combinations of test materials are given to each student in order to avoid any copy. The OECD member and partnership countries give an additional 40 minutes for optional computer-based assessment of mathematics and reading (OECD, 2016b). After this, students answer a background questionnaire including questions about themselves, attitudes to learning, and their families and homes. The questionnaire is completed in 30 minutes. Participant countries can also

conduct some optional the PISA questionnaire about educational career and parent background (OECD, 2012a, 2016b).

The PISA assessment provides three basic indicators which are as follows: (1) a baseline profile of the knowledge and skills of students, (2) some skills which are related to social, educational, economic, and demographic variables, and (3) a memory including a substantial amount of data which will be helpful for the comparison between current and previous assessments (OECD, 2012b).

Method of data analysis

In the current study, a segmentation method was used to define subgroups of students to investigate whether there is an association between likelihood of students' group membership (low achievers, average achievers, and resilient students) and the variables given above. CHAID analysis was used in the study.

CHAID Analysis (Chi- squared Automatic Interaction Detector) is a segmentation or classification method created by Kass (1980). This method is a useful tool to find the relationship between target variable or dependent variable (academic achievement of low-SES students in science and mathematics literacies) and related factors in a visual way called tree. In CHAID analysis, nominal, ordinal, and continues data can be used where continues predictors are divided into categories with almost equal number of groups. CHAID analysis constructs non-binary trees to determine how variables best merge to explain the outcome in the chosen dependent variable. In the first step, categorical predictors are created and the categories are defined. Each pair

of predictor categories is evaluated to find out what is least significantly different with respect to dependent variable.

Decision tree components are created with four types of nodes as follows: (1) root node includes dependent variable; (2) parent's node contains target variable which is split into two or more categories; (3) child node has independent variable categories which come after parent node; and (4) terminal node is the last categories of the CHAID Analysis. In the analysis, most important category having a major effect on the dependent variable comes first and the least important one comes last (Shohov, 2003). The advantages of the analysis are: (1) CHAID Analysis displays a tree and (2) the output is a highly visual and contains no equations. Since, CHAID Analysis does not work well with small sample sizes; the program was set to create a tree with three levels using the sample size of 1200 students.

In this study, two separate CHAID analyses were conducted for science- and mathematics-based group membership. Group membership as a categorical variable was defined as the target variable with three categories and factor scores. Continuous variables were used as predictor variables. Both CHAID analyses were set to produce three levels. For science- and mathematics-based target variables, two trees were produced, respectively. Trees created sub-groups in the nodes from the whole body in terms of ratio of 3 low-SES student categories. These trees were examined to see how the group membership is different from the whole body with respect to values of factor scores. Patterns in higher numbers of resilient students were given a special consideration.

After CHAID trees were obtained, a series of One-Sample t-Tests and One-Way ANOVAs were conducted to see if there was mean difference between the nodes and mean of the whole body in science and mathematics literacies. For ANOVAs, the Sidak post-hoc test was used to locate source of mean differences.

CHAPTER 4: RESULTS

Introduction

The main purpose of the current study is to determine relationship between some teacher- and student-related variables and literacy levels students who have from low socio-economic status based on PISA 2012 Turkey data set. Factors that were hypothesized to be associated with likelihood of academic resiliency were specially focused. To this end, a segmentation approach, CHAID, was employed.

The research question that this study sought answers is as follows:

What are student profiles that are associated with likelihood of academic resilience in science and mathematics literacies based on PISA 2012?

To answer the research factors, students who were defined as low-SES based on ESCS index of PISA 2012, were split into 3 groups as low-SES and low achievers, low-SES and average achievement, and resilient based on their mathematics and science literacy scores, respectively. Then, using the CHAID analysis, subgroups were defined including different combinations of the following predictor variables: *Attitudes towards School: Learning Outcomes, Attitudes towards School: Learning Activities, Sense of Belonging to School, Openness for Problem Solving, Out of School Study Time, Perseverance,* and *Teacher Student Relations* (OECD, 2012a).

Classification tree based on science literacy

CHAID analysis produced the tree for science literacy-based classification of low-SES students. The tree was formed using 5 out of 7 variables. The following predictors were used in science tree*: Attitudes towards School: Learning Outcomes, Sense of Belonging to School, Openness for Problem Solving, Out of School Study Time,* and *Perseverance* (OECD, 2012a).

Whole group (n=1196) includes 392 (32.8%) low-SES and low achievers, 396 (33.1%) low-SES and average achievers, and 408 (34.1%) resilient students. After the classification, there are 19 nodes and 15 terminal nodes (node with no further nodes) at three nodes. At the Level, the whole group is split into 4 nodes with respect to responses given to the factor *Sense of Belonging to School.*

Students in Node 1 (n=76) had a *Sense of Belonging* score of -1.24 (inclusive) or less at Level 1. The group of students in Node 1 included 23 (30.3%) low-SES and low achievers, 21 (27.6%) low-SES and average students, and 32 (42.1%) resilient students. This group of students included more resilient students with respect to the main node.

In Node 2 (n=231), 97 (42.0%) low-SES and low achievers, 64 (27.7%) low-SES and average students, and 70 (30.3%) resilient students with respect to response for the factor *Sense of Belonging to School* had a score between -1.24 (exclusive) and -0.56 (inclusive) at Level 1.

Node 2 (n=231) was split into 5 terminals, Node 5, Node 6, Node 7, Node 8, and Node 9, using the responses given for the factor *Openness for Problem Solving*. All students in these child nodes had a score between -1.24 (exclusive) and -0.56 (inclusive) for the factor *Sense of Belonging to School*.

The group of students in Node 5 (n=144), 60 (41.7%) low-SES and low achievers, 39 (27.1%) of low-SES and average students, and 45 (31.2%) resilient students. In this node, students with respect to factor *Openness for Problem Solving* scored below -0.72 (inclusive). CHAID analysis also included those who do not have a score for this variable.

The groups in Node 6 (n=14) at Level 2 are 12 (85.7%) low-SES and low achievers, 1 (7.1%) low-SES and average student, and 1 (7.1%) resilient student. They scored between -0.72 (exclusive) and -0.54 (inclusive) for the factor *Openness for Problem Solving.*

In Node 7 (n=56), 19 (33.9%) low-SES and low achievers, 18 (32.1%) low-SES and average students, and 19 (33.9%) resilient students scored between -0.54 (exclusive) and 0.69 (inclusive) for the factor *Openness for Problem Solving.*

In Node 9 (n=9), students with respect to response for the factor *Openness for Problem Solving* were in a terminal at Level 2. In Node 7, 4 (44.4%) low-SES and low achievers, 0 (00.0%) low-SES and average student, and 5 (55.6%) resilient students score above 1.11 (exclusive) for the *factor Openness for Problem Solving*.

The group of students in this node had more low-SES and low achievers and resilient students according to the main node.

Node 3 (n=481) was split into 2 terminal nodes, Node 10 and Node 11, with respect to response for the factor *Sense of Belonging to School* at Level 2. In Node 3, 133 (27.7%) low-SES and low achievers, 160 (33.3%) low-SES and average students, and 188 (39.1%) resilient students scored above -0.56 (exclusive) for the factor *Sense of Belonging to School.* The percentage of resilient students in this group was more than the main node.

Node 10 (n=16) is one the terminals of Node 3 which was split into 2 terminals with respect to students' responses of the factor *Attitudes towards School: Learning Outcomes* at the Level 2. In Node 10, 12 (75.0%) low-SES and low achievers, 0 (00.0%) low-SES and average student, and 4 (25.0%) resilient students gave -1.10 (inclusive) and less for the factor *Attitudes towards School: Learning Outcomes.*

In Node 11 (n=465), students with respect to response for the factor *Attitudes towards School: Learning Outcomes* are in a terminal at Level 2. In Node 11, 121 (26.0%) low-SES and low achievers, 160 (34.4%) low-SES and average students, and 184 (39.6%) resilient students score above -1.10 (exclusive) for the factor *Attitudes towards School: Learning Outcomes.* This group of students had greater percentage of resilient students with respect to the main node. The CHAID tree for science literacy is below in the Figure 4.
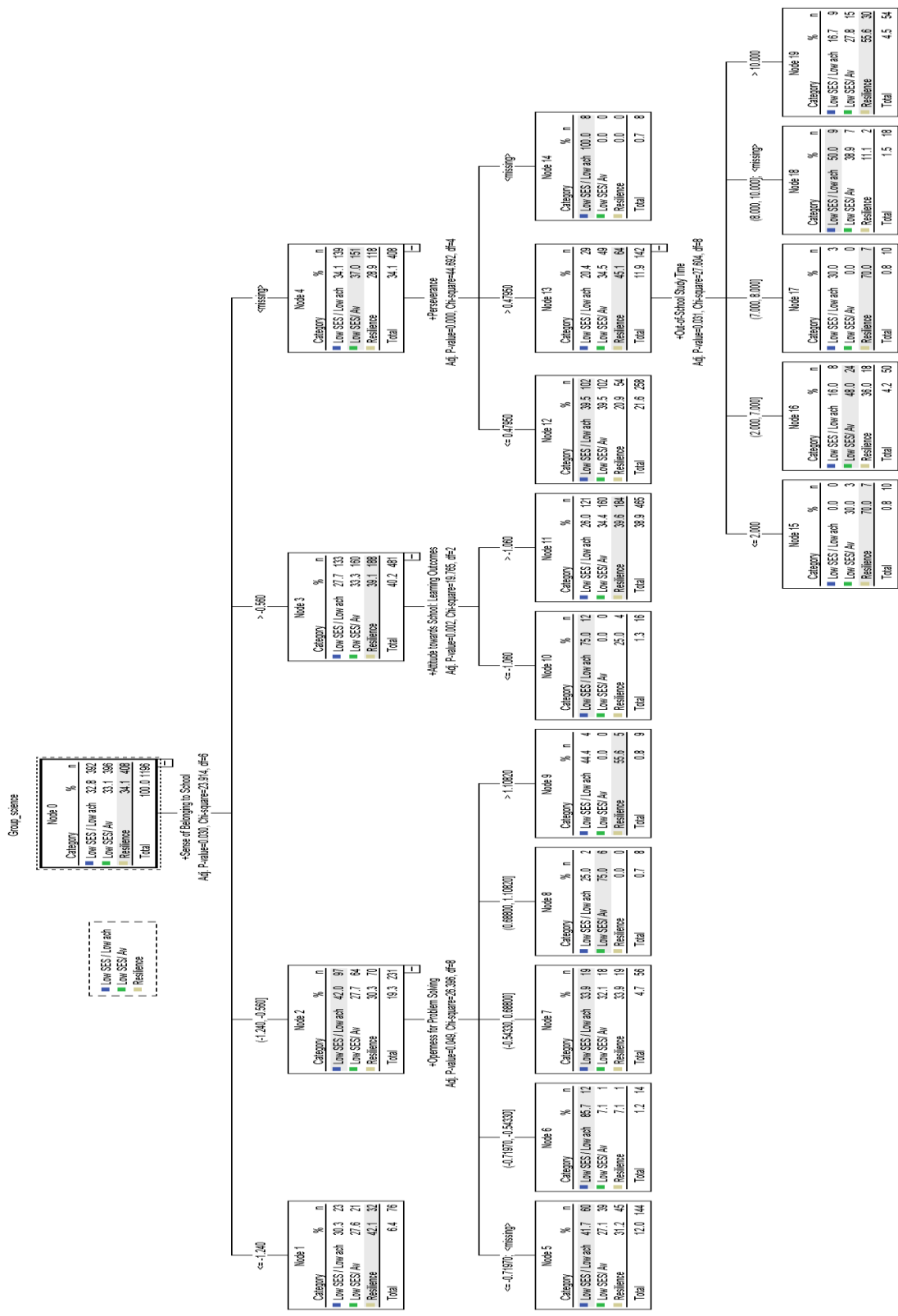
Figure 4. CHAID tree based on science literacy

In Node 4 (n=408), 139 (34.1%) low-SES and low achievers, 151 (37.0%) low-SES and average students, and 118 (28.9%) resilient students were placed with respect to missing responses for the factor *Sense of Belonging to School.* Node 4 is split into 3 subgroups, which were Node 12, Node 13, and Node 14, with respect to response for the factor *Perseverance.*

None 12 (n=258) is one of the terminals of Node 4 which includes the students who responded the factor *Perseverance* as 0.48 (inclusive) or less. Node 12 included 102 (39.5%) low-SES and low achievers, 102 (39.5%) low-SES and average students, and 54 (20.9%) resilient students at Level 2 scored 0.48 (inclusive) and less for the factor *Perseverance* at Level 2.

In Node 13, 29 (20.4%) low-SES and low achievers, 49 (34.5%) low-SES and average students, and 64 (45.1%) resilient the students scored above 0.48 (exclusive) for the factor *Perseverance* at Level 2. This node included mostly resilient students that means the percentage of resilient students are more than the percentage of students in whole group.

Node 13 (n=142) with respect to score for the factor *Out of School Study Time* was split into 5 terminals, Node 15, Node 16, Node 17, Node 18, and Node 19 at Level 3. Node 15 included the students who score the factor *Out of School study Time* as 2.00 (inclusive) minutes or less. In Node 15, 0 (0.0%) low-SES and low achiever, 3 (30.0%) low-SES and average students, and 7 (70.0%) resilient students. the majority of the students were resilient students in this node.

Node 16 (n=50) is one of the terminals of Node 13 which includes the students who answered the factor *Out of School study Time* between 2.00 (exclusive) and 7.00 (inclusive) minutes at Level 3. Node16 included 8 (16.0%) low-SES and low achievers, 24 (48.0%) low-SES and average students, and 18 (36.0%) resilient students. This group of students included more resilient students and percentage of resilient students is more than the whole group's resilient students.

None 17 (n=10) is one of the terminals of Node 13 which included the students who respond the factor *Out of School Study Time* between 7.00 (exclusive) and 8.00 (inclusive) minutes. In Node 17, 3 (30.0%) low-SES and low achievers, 0 (0.0%) low-SES and average student, and 7 (70.0%) resilient students were at Level 3. This node had mainly resilient students and this group of students included more resilient students than the resilient students in the main node.

In Node 18 (n=18), students answered the factor *Out of School study Time* between 8.00 (exclusive) and 10.00 (inclusive) minutes. Node 18 has 9 (50.0%) low-SES and low achievers, 7 (38.9%) low-SES and average students, and 2 (11.1%) resilient students who scored in the factor *Out of School study* between 8.00 (exclusive) and 10.00 (inclusive) minutes at Level 3.

None 19 (n=54) is one of the terminals of Node 13 which includes the students who respond the factor *Out of School study Time* above 10.00 (exclusive) minutes at Level 3. Node 19 has 9 (7%) low-SES and low achievers, 15 (27.8%) low-SES and average students, and 30 (55.6%) resilient students. This node has mainly resilient students and this group of students has more resilient students with respect to the main node. Fifteen one-sample t-tests were conducted to investigate mean difference

between the whole body (435.45) and each node. Node 14 (n=8) is one of the terminals of Node 4 which includes the students who responded neither the factor Sense of Belonging nor *Perseverance* at Level 2. The whole students in Node 14 are 100.0 % of low-SES and low achievers (see Table 2).

Table 2
Terminal nodes of CHAID tree based on science literacy

Node Number	Low-SES /Low achiever (%)	Low-SES /Average Achiever (%)	Resilient (%)	Mean	Median	Mode	SD	Min	Max
14	8 (100%)	0 (0.00%)	0 (0.00%)	336.19	332.98	278.01	32.55	278.01	385.52
6	12 (85.7%)	1 (7.1%)	1 (7.1%)	355.55	367.62	231.94	64.91	231.94	479.98
10	12 (75.0%)	0 (0.00%)	4 (25.0%)	398.42	379.04	267.38	100.50	267.38	615.47
18	9 (50.0%)	7 (38.9%)	2 (11.1%)	400.03	400.63	379.28	44.32	308.50	474.20
8	2 (25.0%)	6 (75.0%)	0 (0%)	415.06	421.47	338.25	38.28	338.25	457.70
12	102 (39.5%)	102 (39.5%)	54 (20.9%)	420.76	416.57	373.68	68.22	269.24	676.46
5	60 (41.7%)	39 (27.1%)	45 (31.2%)	421.56	413.73	354.28	79.98	163.87	633.84
9	4 (44.4%)	0 (0%)	5 (55.6%)	432.97	471.59	338.53	69.35	338.53	519.33
Whole Body	392 (32.8%)	396 (33.1%)	408 (34.1%)	435.45	433.36	447.35	72.97	163.87	676.46
7	19 (39.3%)	18 (32.1%)	19 (39.3%)	442.34	444.46	436.16	72.43	259.92	600.00
1	23 (30.3%)	21 (27.6%)	32 (42.1%)	443.45	438.30	477.19	75.06	216.84	614.17
11	121 (26.0%)	160 (34.4%)	184 (39.6%)	444.86	444.46	416.29	66.26	234.55	657.16
16	8 (16.0%)	24 (48.0%)	18 (36.0%)	454.78	445.67	433.36	64.13	352.23	617.99
19	9 (16.7%)	15 (27.8%)	30 (55.6%)	474.62	467.81	439.89	83.76	279.59	675.81
17	3 (30.0%)	0 (0.00%)	7 (70.0%)	477.33	490.43	346.54	89.02	346.54	602.14
15	0 (0.00%)	3 (30.0%)	7 (70.0%)	500.49	484.88	427.02	60.30	427.02	613.14

In Nodes 1, 3, 9, 11, 13, 15, 16, 17 and 19 (terminal nodes) has a greater percentage of resilient students than the main group, whereas, there is less in nodes 2, 4, 5, 6, 7, 10, 12, 18. There was no resilient student in Nodes 8 and 14.

Mean science literacy difference between each node and whole body is given below in Table 3.

Table 3
Mean science literacy differences between each node and whole body

Node Number	t	df	Mean Difference
1	0.93	75	8.00
5	-2.08	143	-13.88*
6	-4.60	13	-79.89*
7	0.71	55	6.89
8	-1.50	7	-20.38
9	-0.10	8	-2.47
10	-1.47	15	-37.02
11	3.06	464	9.41*
12	-3.45	257	-14.68*
14	-10.56	11	-99.25*
15	3.41	9	65.04*
16	2.13	49	19.33*
17	1.48	9	41.88*
18	-3.39	17	-35.41*
19	3.43	53	39.17*

* $p < .05$

Nodes 5, 6, 11, 12, 14, 15, 16, 18, and 19 are statistically significantly different from the mean of the whole body. Moreover, the means of the whole body and nodes 1, 7, 8, 9, 10, 17 are not statistically significantly different. The results indicated that there

were mean difference between the whole body and nodes which are nodes 5, 6, 11, 12, 14, 15, 16, 18, and 19. There is no mean difference between the whole body and nodes which were 1, 7, 8, 9, 10 and 17. In general, nodes have lower mean of science literacy than the whole body. After CHAID analysis, one-way ANOVA was used.

One-way ANOVA was conducted to examine the mean difference between 8 nodes which are below the mean of the whole body based on science literacy. In Sidak post-hoc test, it was found that there was statistically mean difference between nodes 5 and 6, 5 and 14, 6 and 12, and 12 and 14. There was no mean difference between the nodes which are above the mean of the whole body in science literacy.

The one-way ANOVA compared the means between the whole group and the nodes and determined which nodes' means were statistically significantly different in science literacy. The means of the nodes, 5 (M = 421.56, SD = 79.98), 6 (M = 355.55, SD = 64.91), 8 (M = 415.06, SD = 38.28), 9 (M = 432.97, SD = 69.35), 10 (M =398.42, SD = 100.50), 12 (M = 420.76, SD = 68.22), 14 (M = 336.19, SD = 32.55), and 18 (M = 400.03, SD = 44.32), which are below the mean of the whole body, were tested. In Levene's test, F (7,471) = 3.23, p= .00, was found. Consequently, the assumption of homogeneity of variance was not met. After that, Sidak post-hoc test was conducted to determine which groups' means were significantly different. There was a significantly difference between the means of nodes 5 and 6, 5 and 14, 6 and 12, and 12 and 14 which are below the mean of the whole body in science literacy as determined by one-way ANOVA (F (7) = 4.18, p = .00).

Sidak post-hoc was also conducted for 7 Nodes that had greater mean than the whole body. The means of the nodes 1 (M = 443.45, SD = 75.06), 7 (M = 442.34, SD = 72.43), 11 (M = 444.86, SD = 66.26), 15 (M = 500.49, SD = 60.30), 16 (M = 454.78, SD = 64.13), 17 (M = 477.33, SD = 89.02), and 19 (M = 474.62, SD = 83.76), which are above the mean of the whole body, were tested. In Levene's test, F (6,714) = 0.24, p= .00, was found. Hence, the assumption of homogeneity of variance was met. After that, Sidak post-hoc test was used to determine which groups' means had significantly different. But, there was no significantly difference between the means of the nodes which were above the mean of the whole body in science literacy as determined by one-way ANOVA (F (6) = 2.93, p = .00).

Classification tree based on mathematics literacy

CHAID analysis produced the tree based on mathematics literacy. Tree was defined using 4 out of 7 predictor variables. The predictors in mathematics tree as *Attitudes towards School: Learning Activities*, *Perseverance, Openness for Problem Solving, and Attitudes towards School: Learning Outcomes* were used (OECD, 2012a).

Whole group (n=1196) includes 393 (32.9%) low-SES and low achievers, 395 (33.0%) low-SES and average achievers, and 408 (34.1%) resilient students. After the classification, there are 10 nodes and 7 terminal nodes (Node with no further nodes) in the classification tree. The tree procedure produced nodes at three levels. At Level 1, the students were split into 2 nodes with respect to response for the factor *Attitudes towards School: Learning Activities.* The main node (whole group) includes only 4 (0.33%) students from low-SES and low achievers who did not

respond the factor *Attitudes towards School: Learning Activities*. The whole group (n=1196) was split into 2 sub-nodes which are Node 1 and Node 2.

Node 1 (n=602) is the terminal node of the whole group. Students with respect to the factor *Sense of Belonging to School* are in a terminal node at Level 1. The group in Node 1 includes 224 (37.2%) low-SES and low achievers, 194 (32.2%) low-SES and average students, and 184 (30.6%) resilient students and scored -0.93 (inclusive) or less for factor *Attitudes towards School: Learning Activities.* Node 1 (n=525) was split into 3 terminals, Node 3, Node 4, and Node 5, with respect to students' responses of the factor *Perseverance* are at Level 2.

In Node 3 (n=53), students with respect to response for the factor *Perseverance* are at Level 2. Node 3 includes 30 (56.6%) low-SES and low achievers, 16 (30.2%) low-SES and average students, and 7 (13.2%) resilient students. The students scored between -0.72 (inclusive) and more for the factor *Perseverance.* The percentage of low-achievers in this group is more than the low-achieving students in the whole group.

Node 4 (n=395) includes 157 (39.7%) low-SES and low achievers, 133 (33.7%) low-SES and average students, and 105 (26.0%) resilient students at Level 2. The groups in Node 4 scored between above -0.72 (exclusive) and 0.47 (inclusive) for the factor *Perseverance*. The percentage of low-achievers in this group is more than the low-achieving students in the whole group.

The group of students in Node 5 (n=154), 37 (24.0%) low-SES and low achievers, 45 (29.2%) low-SES and average students, and 72 (46.8%) resilient students scored above 0.47 (exclusive) for the factor *Perseverance*. This group of students includes more resilient students with respect to the main node.

In Node 2 (n=594), students with respect to response for the factor *Attitudes towards School: Learning Activities* are at Level 1. In Node 2, 169 (28.5%) low-SES and low achievers, 201 (33.8 %) low-SES and average students, and 224 (37.7%) resilient students scored above -0.93 (exclusive).

Node 2 (n=154) was split into three subgroups as Nodes 6, 7, and 8. Node 7 and Node 8 are terminals with respect to response for the factor *Openness for Problem Solving* at Level 2.

Node 6 (n=333) has 90 (27.0%) low-SES and low achievers, 131 (39.3%) low-SES and average students, and 112 (33.6%) resilient students and they scored -0.71 (inclusive) and less for the factor *Openness for Problem Solving*. None 6 was also split into 2 terminals which are Node 9 and Node 10.

None 9 (n=78) is one of the terminals of Node 6, which includes the students who responded the factor *Attitudes towards School: Learning Outcomes* as -0.64 (inclusive) or less. Node 9 includes 35 (44.9%) low-SES and low achievers, 25 (32.1%) low-SES and average students, and 18 (23.1%) resilient student at Level 3. The CHAID tree based on mathematics literacy was given below in the Figure 5.
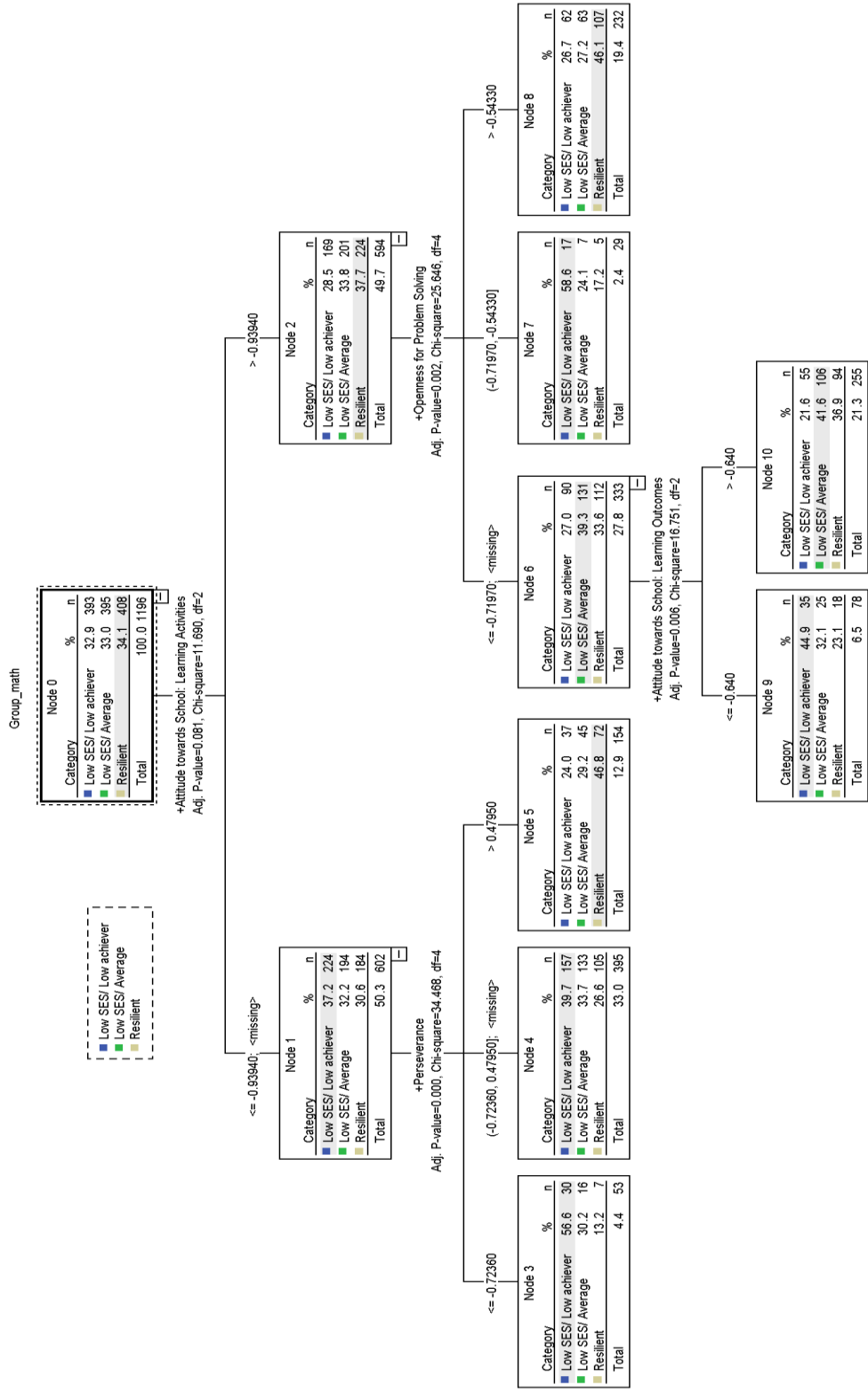
Figure 5.CHAID tree based on mathematics literacy

None 10 (n=255) is one of the terminals of Node 6, which include the students who responded the factor *Attitudes towards School: Learning Outcomes* above -0.64 (exclusive). This node has 55 (21.6%) low-SES and low achievers, 106 (41.6%) low-SES and average students, and 94 (36.9%) resilient students at Level 3. Node 10 has more resilient students than the resilient students in the main node.

None 7 (n=29) is one of the terminals of Node 2, which includes the students who responded the factor *Openness for Problem Solving* between -0.71 (exclusive) and -0.54 (inclusive). Node 7 includes 17 (58.6%) low-SES and low achievers, 7 (24.1%) low-SES and average students, and 5 (17.2%) resilient student at Level 3. Node 7 has more low-SES and low-achieving students than the students in the main node (see Table 4).

Table 4
Terminal nodes of CHAID tree based on mathematics achievement

Terminal Node	Low-SES /Low achiever (%)	Low-SES /Average Achiever (%)	Resilient (%)	Mean	Median	Mode	SD	Min	Max
3	199 (33.3%)	179 (29.9%)	220 (36.8%)	362.15	356.91	260.40	58.23	260.40	474.30
7	32 (49.2%)	19 (27.2%)	14 (21.5%)	372.73	357.69	292.18	55.51	292.18	486.68
4	104 (36.5%)	90 (31.6%)	91 (31.9%)	395.21	387.37	342.89	77.21	202.76	677.83
9	35 (21.7%)	50 (31.1%)	75 (47.2%)	396.09	379.62	401.86	84.70	223.25	649.71
Whole Body	393 (32.9%)	395 (33.0%)	408 (34.1%)	410.62	402.17	389.71	77.44	202.76	718.34
10	15 (53.6%)	13 (46.4%)	0 (0.00%)	420.93	418.92	344.22	66.57	248.33	626.58
8	132 (35.5%)	110 (29.6%)	130 (34.9%)	426.33	428.34	337.44	74.53	272.01	656.02
5	47 (45.6%)	41 (39.8%)	15 (14.6%)	440.95	428.42	346.08	84.42	250.51	718.34

None 8 (n=37) is one of the terminals of Node 2, which include the students who responded the factor *Openness for Problem Solving* above -0.54 (exclusive). This node has 62 (26.7%) low-SES and low achievers, 63 (27.2%) low-SES and average students, and 107 (46.1%) resilient students at Level 2. Node 8 has more resilient students than the resilient students in the whole body.

In Node 5, 8, and 10 (terminal nodes) have a greater percentage of resilient students than the main group, while there are less number of resilient students in nodes 3, 4, 7, and 9.

Seven one-sample t-tests were conducted to investigate mean difference between the whole body (410.62) and each node. It can be concluded that nodes 3, 4, 5, 7, 8, and 10 are statistically significantly different from the mean of the whole body. On the other hand, the means of the whole body and node 9 were not statistically significantly different (See Table 5). The results showed that there were mean difference between nodes and the whole body, except node 9. In general, nodes had lower mean of mathematics literacy than the whole body.

Table 5
Mean mathematics literacy differences between each node and whole body

Node Number	t	df	Mean Difference
3	-6.05	52	-48.46*
4	-3.98	398	-15.40*
5	4.46	153	30.33*
7	-3.67	28	-37.88*
8	3.21	231	15.71*
9	-1.51	77	-14.52
10	2.47	254	10.31*

* $p < .05$

One-way ANOVA was conducted to examine the mean difference between 4 nodes which were below the mean of the whole body based on mathematics achievement. The one-way ANOVA compared the means between the whole group and the nodes and determined which nodes' means were statistically significantly different in mathematics literacy.

The means of the nodes 3 (M = 362.5, SD = 58.23), 4 (M = 395.21, SD = 77.21), 7 (M = 372.73, SD = 55.51), and 9 (M = 396.09, SD = 84.70), which were below the mean of the whole body, were tested. In Levene's test, $F_{(3,555)} = 2.09$, p= .10, was found. Therefore, the assumption of homogeneity of variance was met. After that, Sidak post-hoc test was conducted to determine which groups' means were significantly different. There were a significantly difference between the means of nodes 3 and 4, which were below the mean of the whole body in mathematics literacy as determined by one-way ANOVA $(F_{(3)} = 3.64, p = .01)$.

The means of the nodes 5 (M = 440.95, SD = 84.42), 8 (M = 426.33, SD = 74.53), and 10 (M = 420.93, SD = 66.57), which are above the mean of the whole body, were tested. In Levene's test, $F_{(2,638)} = 5.50$, p= .00, was found. Thus, the assumption of homogeneity of variance was not met. After that, Sidak post-hoc test was used to determine which groups' means were significantly different. There was no mean difference between the nodes which are above the mean of the whole body in mathematics literacy as determined by one-way ANOVA $(F_{(2)} = 3.57, p = .02)$. In the science achievement, the number of low-SES students who scored 501 (OECD average) and above were 203. In the mathematics achievement, there are 164 low-SES students who scores 494 (OECD average) and above.

CHAPTER 5: DISCUSSION

Introduction

In this chapter, there is an overview of the study which includes the aims of the research and discussion of the results of the study. The study is compared with previous researches on teacher- and school-related factors on the academic achievement of low-SES students. This chapter also provides implications for practice and future studies.

Overview of the study

The present study was conducted using PISA 2012 data set in order to identify the factors related to teacher and school on the achievement of the students who have disadvantaged background.

The study addressed the following question:

What are student profiles that are associated with likelihood of academic resilience in science and mathematics literacies based on PISA 2012?

In the study, three different analyses were conducted. First, the data were analyzed using CHAID analysis. 1200 students were chosen from 4848 randomly selected students from the schools of 12 economic regions in Turkey for PISA 2012. These 1200 students were Turkish students who were at the bottom quarter in ESCS (-2.28 or below) were labeled as socio-economically disadvantaged students.

The students were categorized into three groups as low-SES and low-achievers, low-SES and average students, and resilient. Disadvantaged students who scored above average of Turkey in mathematics (M=370.96) and science (M=400.57) was called resilient student (n=408). Disadvantaged students with the score below the average of Turkey in mathematics was called low-SES and low achievers (n=396). Disadvantaged student who had the average of Turkey in mathematics and science were called average student (n= 396).

Then, the data were split into segments for science and mathematics scores of students respectively regarding factors of *Out of School Study Time* (6 items), *Teacher Student Relations* (5 items), *Sense of Belonging to School* (9 items), *Attitudes towards School: Learning Outcomes* (4 items), *Attitudes towards School: Learning Activities* (4 items), *Perseverance* (5 items), and *Openness for Problem Solving* (5 items) (OECD, 2012a). Then, two classification trees were formed as science tree and mathematics tree.

After two CHAID trees were acquired, a series of one-sample t-tests and one-way ANOVAs were conducted to see if there was no mean difference between the nodes and the mean of the whole body in science and mathematics literacies. These procedures were completed for the scores of low-SES students on both mathematics and science literacies. As a result of two CHAID analyses, scores of low-SES students on mathematics and sciences literacies were dependent variables and seven factors chosen from PISA 2012 survey were predictive variables. It was found that some variables out of seven factors were related to mathematics and science scores

and these variables were also found to create some significant differences in low-SES students' performances in mathematics and science literacies.

Major findings

Student profiles based on science literacy scores

The classification tree formed by CHAID analyses for the science achievement of low-SES students was defined as the target variables that are attitudes towards school: learning outcomes, sense of belonging to school, openness for problem solving, out of school study time, and perseverance of the students as significant predictors for science achievement. Attitudes towards school: learning outcomes, attitudes towards school: learning activities, openness for problem solving, and perseverance are the predictors for mathematics achievement. CHAID analyses used 6 out of 7 factors (5 factors in science literacy and 4 factors in mathematics literacy) to create parent and terminal nodes at tree levels. The program was set to create only three levels of nodes.

Firstly, the means of the resilient groups are significantly different from the mean of the whole body. Resilience is an interactive concept and cannot be measured directly. Consequently, some individuals show different resilience across their capacities and backgrounds (Rutter, 2012). There are 5 different profiles that include resilient students and 4 different profiles having non-resilient students in the science tree.

In Profile 1, there is a group of resilient students who have low sense of belonging to school in Node 1. This result shows that all resilient students do not always feel sense of belonging.

In Profile 2, the group of resilient students in Node 9 has high level of sense of belonging to school and they have the features that are open to solve questions. In the literature, the profile of a resilient child has highly developed problem-solving skills, considering realistic future plan, and possessing a positive sense of being able to achieve the task (Oswald, Johnson, & Howard, 2003).

In Profile 3, the resilient students in Node 11 have high sense of belonging and attitudes towards school which means that the resilient students in this group feel happy in the school and have a sense of inclusion by other students. As Finn and Rock (1997) states that academic resilient students are actively engaged in schools and their engagement has two components that are school environment and engagement in lessons. The literature reported that sense of belonging of students to the school is one of the key factors for the academic achievement (Aydiner & Kalender, 2015; Demir & Kalender, 2014).

In Profile 4, the resilient students in Node 15 have high sense of belonging to school and they rarely study after school. This result means that school is the key factor in order to achieve academic goals but out of school study time does not seem to have such relationship with likelihood of being resilient. The students with this profile are satisfied in the school and make friends in the school easily. Engagement of low-SES students to the school has an essential role because school protects the individual from risk factors and motivates them for academic success (Ungar & Liebenberg, 2013). Attachment of low-SES students to the school has big effect on students' achievement because school protects the individuals from risk factors and motivates

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the person for academic success. Although students do not study out of school, school can supply a safe and qualified educational environment for success.

In Profile 5, the group of students in Nodes 16, 17, and 19 studies out of school regularly and they never give up when they face difficulties. The features of the results support the characteristics of resilient students in the literature. Students with autonomy have the ability to organize their own learning and design their own self-evaluation, and these students have their own point of view about school subjects and projects (Boud, 2012).

Besides nodes with high rate of resilient students, nodes which include low-SES and low-achieving students were also found in CHAID tree based on science literacy. In Profile 6, the students in Node 5 are low-SES and low-achievers and their scores are less than the whole body. These low-achievers have high strong sense of belonging to school, but they are not open to problem solving. This result shows that sense of belonging to school is not a key factor alone to a resilient student.

In Profile 7, this group of students in Node 6 is lack of sense belonging to school and openness to problem solving. This result corresponds with the information in literature as physical conditions of schools and classroom atmosphere such as number of students and attitudes of teacher toward students play an effective role on the students' engagements and sense of belonging (Finn & Voelkl, 1993). The students should have two judgments to be resilient: first, the individuals are in a high-risk status such as having a family in poverty or parents in low academic level;

second, the individuals have a high adaptation capacity to school or environment (Masten & Coatsworth, 1998).

In Profile 8, Nodes 12 and 14 have students who define themselves as having low coping skills to beat the odds. In the literature, the common aspects of the resilient children are having problem solving skills, autonomy, sense of purpose, and sense of having a bright future (Howard & Johnson, 2000). These children have "hope" to overcome problems which they have to face in their lives. Otherwise, they may fail at school or in social life.

Profile 9, the low-achieving students in Node 18 has high level of sense of belonging to school and perseverance. These students also do their homework, but this profile may define the students who are successful in retention tests (Cooper & Valentine, 2001), yet the PISA tests are prepared as transfer test which assesses students' capability to use their knowledge acquired from the school curriculum to solve real-life problems (OECD, 2013b).

Student profiles based on mathematics literacy scores

The classification tree based on mathematics achievement scores coincide with literature for students with both achievement and failure. There are 3 different resilient student profiles and two different non-resilient profiles found in mathematics tree.

In Profile 1, resilient students in Node 5 have greater scores than the resilient students in whole body. These students think that school gives them confidence and

an opportunity for future job. They have high scores of perseverance which means they rarely give up when they encounter difficulties. Hope is one of internal protective factors in resilience and these children have contribution to risk factors caused by family and environment (Horton & Wallander, 2001).

In Profile 2, the group of resilient students in Node 8 thinks that trying hard is very important and they also enjoy receiving good grades. These students see the school as an important factor helping them go to college and find a job. Thinking positively about the school is essential because school protects the individual from risk factors and motivates the person for academic success and future life achievement (Ungar & Liebenberg, 2013). In addition to this, school is the only place for low-SES students to enhance their academic achievement; it is obvious that students with academic resilient have a high level of attachment to the school (Gilligan, 2000).

In Profile 3, this group of resilient students in Node 10 thinks that the things are ideal at school because the school has useful learning activities and outcomes for their academic and future life goals. These students also think that they are open for solving problem. As corresponding to literature, school environment plays a big role on students to gain academic achievement and self-efficacy to get prepared for real-life problems. According to the social cognitive theory of Bandura, self-efficacy beliefs provide the foundation for motivation, well-being, and personal accomplishment to foster students' learning outcomes. Student's confidence in academic skills enhances students to get high marks in exams. Mayer (1998) states that self-efficacy theory predicts that the students work harder on a learning task

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when they have judgment about themselves as being capable than the students who have lack of confidence in learning ability.

With the analysis of resiliencies as the specific group of students in the terminals, low-SES and low-achiever students were also analyzed in CHAID tree based on mathematics literacy. Nodes 3, 4, 7, and 9 have more low-SES and low-achiever population than the whole body.

In Profile 4, there are significant number of students in Nodes 3 and 4 whose percentages are greater than the low-SES and low-achieving group in the whole body. These students with low academic achievement have similar aspects of thoughts about the school and they are not persistent to challenge with difficulties. They think that school does not prepare them for the future life and school is only a place for waste of time. These results mean that students do not have hope to get a job with the help of school and they have lack of self-confidence. Bandura (1997) states that if students have a choice they will be able to build autonomy which refers to an ability to organize students' own learning, to build their own self-evaluation, and to have their strong perception about school as a good learning environment.

Additionally, self-efficacy refers to self-judgment of the capability to accomplish some task as the aspect of a resilient student (Mayer, 1998). In Profile 4, the low-achieving students don't have coping skills towards difficulties. Therefore, these students are not persistent which means that they give up easily and do not strive for perfection.

In Profile 5, low-SES and low-achiever students in Nodes 7 and 9 study hard to solve complex problem. This result shows that there may be some problems about the way of learning or the types of instruction given by teachers. Since the findings show that the teacher who has a standard teaching certificates have a statistically significant effect on the students' scores in tests (Goldhaber & Brewer, 2000), there must be some questions about the way of teaching and giving homework.

In the study of Jindal-Snape and Miller (2008), formal school environment is defined as a protective factor or the opposite so the role of teacher and administrator plays a great role for students to have positive perception about school environment.

Implications for practice

Upon the completion of the present study, the results suggest a major addition into Turkish educational policies towards low-SES students who have significant number from the whole 15-year-old students in Turkey. Since there is no a distinct policy to support and encourage low-SES students, this study can enlighten the ways of policy makers to design new policies to support and reinforce low-SES students to be academically successful. The results of the study show that there are several ways to be resilient. There are different ways to help students who are coming from low-SES background in order to make them academically successful. As teachers are one of the key factors in achievement from the perspective of low-SES students, they should be more caring, supportive and interested in the needs of the students. For students, teachers are the adults who are more than the family members while being educated in the schools. Therefore, teachers need to be trained with respect to students' needs at the faculties as they are pre-service teachers and then in the

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faculties at school where they work because teachers should be life-long learners as an example for the students.

Implications for further research

This research can be reported as an effort in understanding of teacher- and school-related factors as protective and risk factors that affect the academic achievement of low-SES students in Turkey. This study was a quantitative analysis of students' performance in science and mathematics literacies using PISA 2012 exam results and survey. Thus, further studies could be conducted using qualitative data, which includes interview with students, teachers, and school administrators to build key findings of this research.

Furthermore, CHAID analyses were limited to three levels in this study. The variables as *Teacher Student Relations* (5 items) could be included in the analyses. However, these items were not investigated as significant predictors which might also have important relationships with academic resiliency. Thus, it is strongly recommended that CHAID analyses with higher depths and more variables were conducted.

Limitations

This study is limited with the data set of the PISA survey 2012 (de Carvalho, Gamboa, & Waltenberg, 2012). In addition to that, the PISA 2012 has just four subjects to assess: mathematics, science, reading, optional computer-based assessment of mathematics and reading, and questionnaire about educational career and parent background (Mortimore, 2009).

The data set only includes only the students between the ages of 15 years and 3 months and ages of 16 years and 2 months. These young adults receive formal education in Turkey so generalization of the result may be limited. This data set cannot give us to create a prediction for pre-school and primary school education which are significantly important for student' achievement throughout academic life because pre-school education provides a better start to their schooling and this effect can help to reduce negative effects of social disadvantages (Bracey, 1994; Sylva et al., 2010).

Moreover, although data sets of PISA 2012 are trustworthy, this database does not provide the whole reality of Turkey such as school dropout rate, which is a significant educational problem in many countries, and students leave the school to provide for their low-income family (Taylı, 2008).

The CHAID analyses were set to create only three levels of nodes. There would have been more factors included in the trees, if the CHAID analysis had been set to generate more than three levels because sample size was only convenient for three levels.

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APPENDICES

APPENDIX 1: PISA 2012 Student Background Questionnaire Items

Student Questionnaire

Code (STQ)	Original Names of the Items	Abridged Names of the Items
ST57Q01	Homework or other material assigned by your teachers	Homework
ST57Q02	Out of the time spent in (a), how many hours do you work on your homework with somebody overlooking and providing help if necessary ("guided homework"), either at school or elsewhere?	Guided Homework
ST57Q03	Work with a personal tutor (whether paid or not)	Personal Tutor
ST57Q04	Attend out of school classes organized by a commercial company and paid for by your parents	Commercial Company
ST57Q05	Study with a parent or another family member	With Parent
ST57Q06	Practice content from school lessons by working on a computer (e.g., learn vocabulary with training software)	Computer
ST86Q01	Students get along well with most teachers.	Get Along with Teachers
ST86Q02	Most teachers are interested in students' well-being.	Teachers Are Interested
ST86Q03	Most of my teachers really listen to what I have to say	Teachers Listen to Students
ST86Q04	If I need extra help, I will receive it from my teachers.	Teachers Help Students
ST86Q05	Most of my teachers treat me fairly.	Teachers Treat Students Fair
ST87Q01	I feel like an outsider (or left out of things) at school.	Feel Like Outsider
ST87Q02	I make friends easily at school.	Make Friends Easily
ST87Q03	I feel like I belong at school.	Belong at School
ST87Q04	I feel awkward and out of place in my school.	Feel Awkward at School
ST87Q05	Other students seem to like me.	Liked by Other Students

ST87Q06	I feel lonely at school.	Feel Lonely at School
ST87Q07	I feel happy at school.	Feel Happy at School
ST87Q08	Things are ideal in my school.	Things Are Ideal at School
ST87Q09	I am satisfied with my school.	Satisfied at School
ST88Q01	School has done little to prepare me for adult life when I leave school.	Does Little to Prepare Me for Life
ST88Q02	School has been a waste of time.	Waste of Time
ST88Q03	School has helped give me confidence to make decisions.	Gave Me Confidence
ST88Q04	School has taught me things which could be useful in a job.	Useful for Job
ST89Q02	Trying hard at school will help me get a good job.	Helps to Get a Job
ST89Q03	Trying hard at school will help me get into a good <college>	Prepare for College
ST89Q04	I enjoy receiving good <grades>.	Enjoy Good Grades
ST89Q05	Trying hard at school is important.	Trying Hard is Important
ST93Q01	When confronted with a problem, I give up easily.	Give up easily
ST93Q03	I put off difficult problems.	Put off difficult problems
ST93Q04	I remain interested in the tasks that I start.	Remain interested
ST93Q06	I continue working on tasks until everything is perfect.	Continue to perfection
ST93Q07	When confronted with a problem, I do more than what is expected of me.	Exceed expectations
ST94Q05	I can handle a lot of information.	Can Handle a Lot of Information
ST94Q06	I am quick to understand things.	Quick to Understand
ST94Q09	I seek explanations for things.	Seek Explanations
ST94Q10	I can easily link facts together.	Can Link Facts
ST94Q14	I like to solve complex problems.	Like to Solve Complex Problems